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SURGERY
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VOLUME 87 OCTOBER, 1948 NUMBER 4

SURGICAL PROCEDURES EMPLOYED AND ANATOMICAL VARIATIONS ENCOUNTERED IN THE TREATMENT OF CONGENITAL PULMONIC STENOSIS

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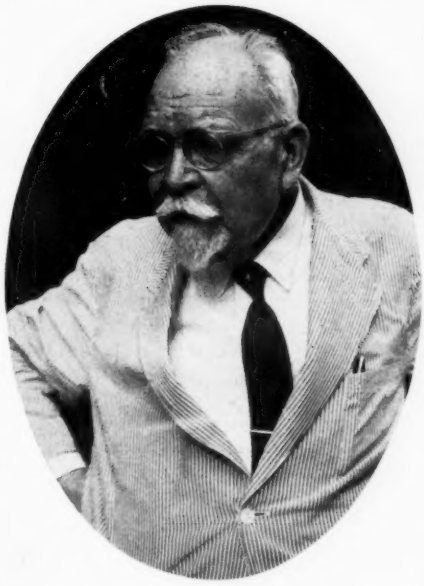
THROUGH the generosity of the Nu Sigma Fraternity at Tulane University it is my good fortune to be invited to deliver the first Rudolph Matas Lecture. I regard this opportunity as a great privilege, imperfectly as I shall be able to meet its obligations, for the friendship and leadership of Dr. Matas have been for me, as well as for surgeons throughout the world, a dear possession and a strong influence. I take delight in the thought that the late Professor Halsted would be pleased that one of his pupils should inaugurate a lectureship which honors the name of the close friend for whom he had the greatest admiration. Because they were bound together by various ties, the visits of Dr. Matas to Baltimore were frequent. It is to be feared that as medical students we failed to appreciate fully the high value of the clinics conducted by this distinguished visitor on endoaneurysmorrhaphy, on methods for determining and increasing the collateral circulation in the presence of aneurysm, on the use of metal bands in the treatment of aneurysm, and on the causes of elephantiasis, all problems in which he and Dr. Halsted were deeply interested. It may be of significance that one of the students present at these clinics, Dr. Arthur Blakemore, has made what is probably the most important contribution to the treatment of aneurysm since the work of Dr. Matas. The death of Dr. Halsted in 1922 ended a beautiful



Rudolph Matas

The first Rudolph Matas Lecture, established by Beta Iota Chapter, Nu Sigma Nu, delivered at New Orleans on January 28, 1948.

From the Department of Surgery of The Johns Hopkins University and The Johns Hopkins Hospital.

Aided by a gift from the Robert Garrett Fund for the Surgical Treatment of Children and the Carolyn Rose Strauss Foundation, Inc. grant for Diagnosis and Treatment of Congenital Cardiovascular Defects.

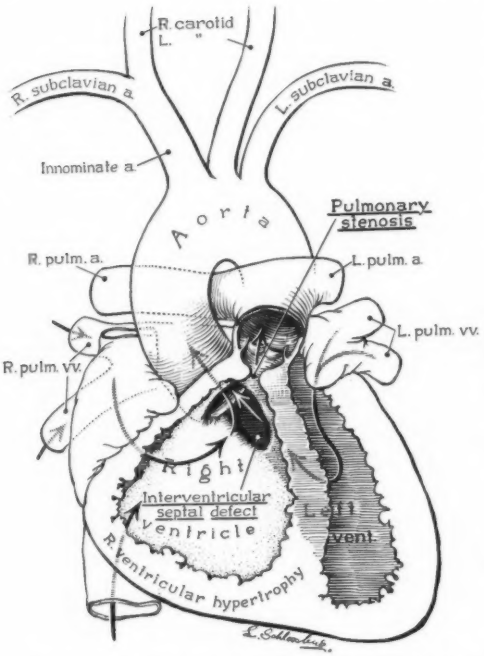


Fig. 3. A diagram of the tetralogy of Fallot showing pulmonic stenosis in the conus region, an interventricular septal defect, an aorta which overrides the ventricular septum and hence which receives mixed venous as well as arterial blood, and right ventricular hypertrophy. The cyanosis is due to the fact that the aorta receives inadequately oxygenated blood from the right ventricle as well as to the fact that the pulmonary blood flow is small as a result of the pulmonic stenosis or atresia.

friendship, and it was fitting that Dr. Matas should give the principal address on the occasion of the memorial service.

The surgical interests of Dr. Matas have not been limited to problems of the vascular system. In order to emphasize the variety and the importance of his contribution it is necessary merely to mention his pioneer work on continuous intravenous therapy in the care of surgical patients, on the use of an indwelling tube for decompressing the intestinal tract, on the employment of spinal anesthesia, and on the use of motion pictures as a means of teaching.

One of the occasions which I regret most to have missed was the meeting of the International Society of Surgery in 1939 at the time when Dr. Matas was President of this most distinguished of international surgical organizations. A number of those fortunate enough to be there have told me of the success of the meeting, of the universal popularity of the President, and of his remarkable success as a linguist and a presiding officer. It was my good fortune to be present last September at the meeting of the International Society of Surgery in London, and I shall never forget the acclaim accorded Dr. Matas. There was no doubt as to the place which he occupied in the affection and esteem of everyone. The members of Nu Sigma Nu are both fortunate and wise in their choice of a name for this lectureship in that they are honoring a native son, the leading citizen of Louisiana, a former professor of surgery at Tulane, and one of the foremost figures in the surgical world today.

Whereas most of the publications of Dr. Matas have dealt with acquired cardiovascular disorders, this lecture will be limited to a consideration of congenital defects with particular reference to pulmonic stenosis and associated abnormalities. Major attention will be focused on technical methods by which the flow of blood to the lungs may be increased and on the anomalies of systemic and pulmonary blood vessels which have been observed during the course of such operations.

At the present time there are only three general types of congenital cardiovascular defects which are amenable to surgical treatment. I refer first to patent ductus arteriosus, in which the shunt is from the aorta to the pulmonary artery and hence in which there is no cyanosis. The work of the left ventricle is greatly increased, heart failure may supervene, and obviously the treatment consists of closure of the patent ductus. The second type which responds favorably to surgical treatment is coarctation of the aorta. Marked constriction or atresia of the thoracic aorta causes hypertension in the upper part of the body and hypotension in the lower part. There is no shunt of blood from the lesser to the greater circulation and hence there is no cyanosis. The preferred treatment consists of excision of the stenotic area and end-to-end anastomosis between the proximal and distal segments of the aorta. The third general type of abnor-

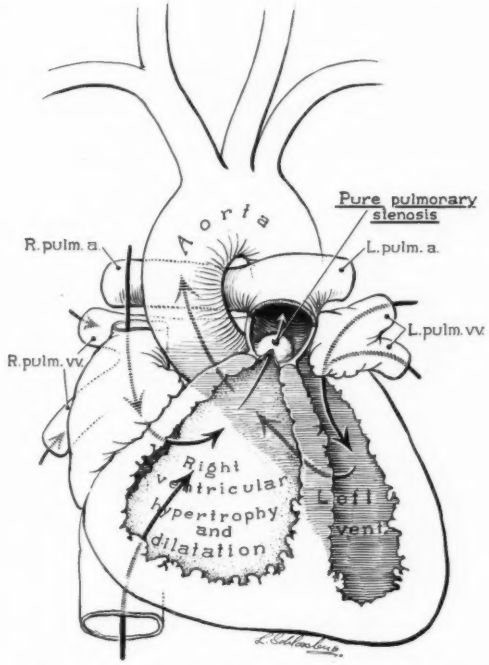


Fig. 4. Pure pulmonary stenosis, a relatively rare lesion, in which the stenosis is usually in the pulmonary valve. Since there is not an interventricular defect and the aorta does not receive mixed venous blood, cyanosis is not a prominent feature. Patients with pure pulmonic stenosis would not be greatly benefited by the creation of an artificial ductus arteriosus.

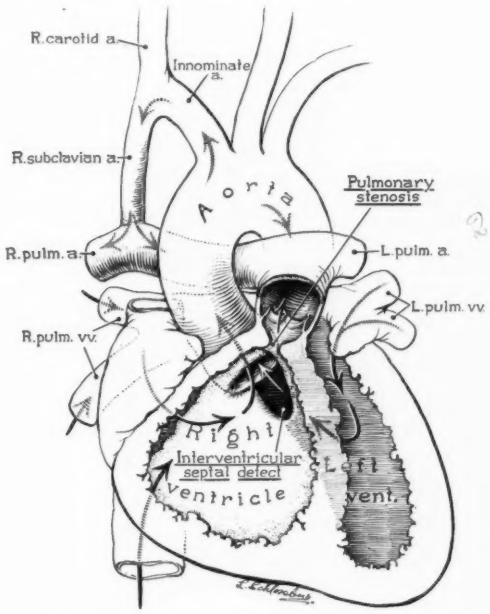


Fig. 5. Showing the alteration in the circulation which results following the creation of an artificial ductus arteriosus in the treatment of the tetralogy of Fallot. The illustration shows an anastomosis between the proximal end of the subclavian artery and the side of the right pulmonary artery, which allows the shunted blood to pass to the right or the left lung. The quantity of inadequately oxygenated blood which is exposed to the oxygen in the lungs is greatly increased. Fortunately the pressure in the aorta and its branches is high, that in the pulmonary artery is low, and a large quantity of blood passes through an opening of moderate size. One may use one of the large branches of the arch of the aorta or the aorta itself for the anastomosis.

mality which may be treated by operative means is that in which there is an inadequate pulmonary blood flow and in which mixed venous blood enters the arterial circulation. The most frequently encountered condition of this type is the tetralogy of Fallot in which there is pulmonic stenosis or atresia, an interventricular septal defect, an aorta which overrides the septal defect and receives blood from both ventricles, and right ventricular hypertrophy. Preoperative and postoperative photographs of a child with this condition are presented in Figures 1 and 2 (frontispiece). It is estimated that approximately 70 per cent of patients 2 years of age and over who are cyanotic on the basis of congenital heart disease have this combination of defects. A diagram is given in Figure 3.

Since the pulmonic stenosis is the major defect in the tetralogy of Fallot, I wish to emphasize the point that the cyanosis is due primarily to the fact that there is an interventricular defect with an overriding aorta which receives mixed venous blood from the right ventricle as well as oxygenated blood from the left ventricle. The severity of the cyanosis depends, in addition to other conditions, upon the degree of the pulmonic stenosis and the degree of overriding of the aorta. It is known that at least 5 grams of reduced hemoglobin per 100 cubic centimeters of circulating blood are necessary in order to produce obvious cyanosis. In pure pulmonic stenosis in which there is no communication between the two

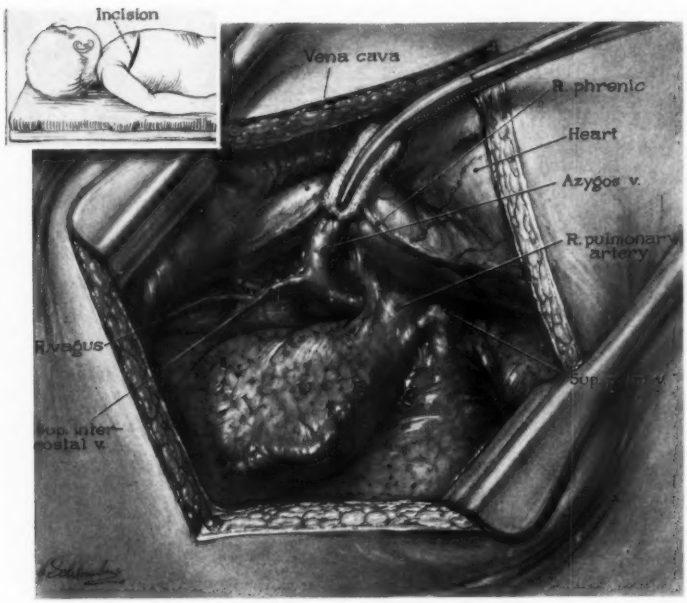


Fig. 6. This figure and the succeeding seven figures show the steps of an anastomosis between the proximal end of the right subclavian branch of the innominate artery and the side of the right pulmonary artery. This is the procedure which we prefer in most of the patients in the age group from two years to thirteen years. The opposite side is used if the aorta descends on the right instead of the left. The insert at the top left shows the position of the patient on the operating table. The patient is lying on his back with the right side slightly elevated. The incision in the pleura is usually in the second interspace. The larger drawing shows the contents of the upper part of the right pleural cavity. The azygos vein is to be doubly ligated and divided. The patient's head is to the reader's left.

sides of the heart, cyanosis is minimal or absent. Dyspnea and disability may be extreme depending upon the degree of the stenosis. A diagram of pure pulmonic stenosis is given in Figure 4. Since in pure pulmonic stenosis the blood which passes through the lungs is properly oxygenated and since the aorta does not usually receive mixed venous blood, the creation of an anastomosis between the greater and lesser circulations would not result in dramatic improvement. In contrast to pure pulmonic stenosis in the tetralogy of Fallot in which there is an inadequate pulmonary blood flow due to pulmonic stenosis or atresia, it is evident that there is also an interventricular defect with an overriding aorta which results in the passage of mixed venous blood as well as arterial blood into the aorta and that this combination of defects results in cyanosis and disability. Under such circumstances, if some of the inadequately oxygenated blood in the aorta were allowed to pass through the lungs as a result of the creation of an artificial ductus arteriosus, this shunted blood would take up oxygen and a diminution in the cyanosis would result. The general alterations in the circulation that occur as a result of such an operation (4) are illustrated in Figure 5.

Patients with pulmonic stenosis or atresia in whom some mixed venous blood enters the aorta should be benefited by the creation of an artificial ductus arteriosus. Among the conditions falling into this category are the tetralogy of Fallot with pulmonic stenosis or atresia, nonfunctioning right ventricle with functional pulmonic stenosis or atresia, single ventricle with pulmonic stenosis or atresia, truncus arteriosus with circulation to the lungs through

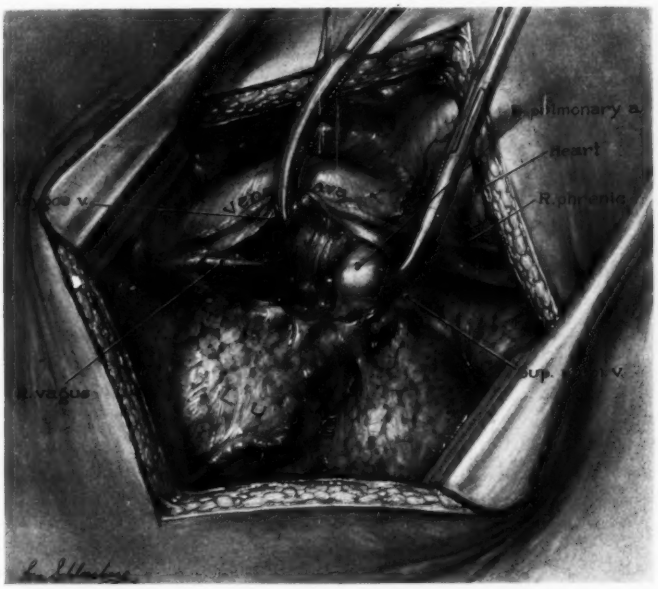


Fig. 7. Showing the right pulmonary artery. It lies superior and slightly posterior to the superior pulmonary vein. Identification of these two structures may be difficult when the pulmonary artery is small and when there are extensive collateral arterial vessels. A long length of the right pulmonary artery is dissected free of the adjacent tissues and the point of division of the artery is exposed.

bronchial arteries and with a rudimentary pulmonary artery with which an anastomosis can be performed, transposition of the aorta and pulmonary artery in association with a large interventricular defect and pulmonic stenosis, and numerous variations in these defects. It is possible that patients with a normal or increased pulmonary blood flow in association with an interventricular septal defect and an overriding aorta (as in the Eisenmenger complex) may be improved somewhat by the creation of an artificial ductus arteriosus. This point has not been determined. Certainly the primary indication for the operation is an inadequate flow of blood to the lungs and an interventricular defect with an overriding aorta.

Clinical, laboratory and radiological evidences of the presence of pulmonic stenosis or atresia have been described in detail by Dr. Taussig and by others. Included among the important positive points in the typical case are cyanosis, dyspnea, poor exercise tolerance, squatting, low arterial oxygen saturation, polycythemia, a systolic murmur in the pulmonary area, a concavity in the pulmonary area on x-ray examination, a clear pulmonary window in the left anterior oblique position, diminished hilar shadows, and absence of pulsations at the hili of the lungs on fluoroscopic examination. A useful laboratory procedure described recently by Dr. Bing and his associates is the finding that the oxygen consumption per liters of ventilation decreases with exercise in patients with the tetralogy of Fallot whereas it increases in those without pulmonic stenosis. A history of squatting following exertion is given by the great majority of patients with inadequate pulmonary blood flow. Many of the patients literally sit upon their heels for extended periods. In general, radiological methods are of much greater aid in diagnosis than is physical examination although both are important. It is obvious that the severity of cyanosis and disability will depend to a considerable extent on the degree of

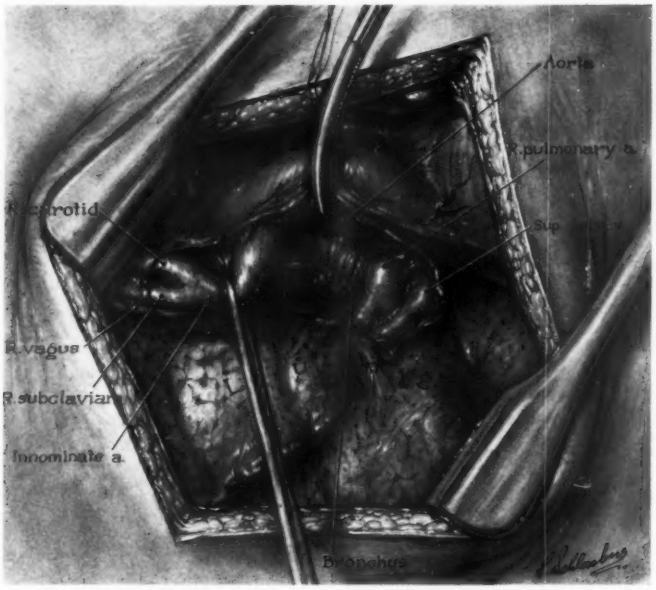


Fig. 8. Showing the exposure of the innominate artery and its branches, the right subclavian and the right common carotid artery. Exposure is accomplished by dissecting posterior to the superior vena cava. The innominate artery usually arises from the aorta slightly to the left of the trachea. These vessels are dissected free of the adjacent tissues and adequate mobilization obtained. If a thyroidea ima branch is present, it is ligated and divided.

pulmonic stenosis and overriding of the aorta. Some patients with severe disability may have little polycythemia and cyanosis.

TECHNIQUE OF OPERATION

Possible means by which the flow of blood to the lungs may be increased in the presence of the tetralogy of Fallot and similar conditions include an attack on the stenotic area itself or the use of a "shunt" operation in which the stenosis is by-passed. The stenotic area is usually in the pulmonary conus of the right ventricle rather than in the pulmonary valve area, and excision or incision would be not only dangerous but probably would be followed by a recurrence of the stenosis at a later date. Because of this probability the better procedure would appear to be that in which some of the improperly oxygenated blood in the aorta is shunted to the lungs. This is possible because of the proximity of the thoracic aorta and its branches to the two major branches of the pulmonary artery. It may be accomplished by anastomosing the aorta or one of the branches of the arch of the aorta to one of the two pulmonary arteries. Fortunately the pressure in the aorta and its branches is high and the pressure in the pulmonary artery and its branches is low, and a good anastomosis will result in the passage of a large quantity of improperly oxygenated blood from the aorta through the lungs. An anastomosis which is properly performed between blood vessels of good caliber will almost certainly remain patent.

My associates and I have performed the following anastomoses between the systemic and pulmonary arteries in patients: (1) the proximal end of the right or left subclavian artery and the side of the right or left pulmonary artery; (2) the proximal end of the right or left subclavian artery and the distal end of the right or left pulmonary artery; (3) the proximal end of the carotid or innominate artery

Fig. 9. The relationship of the vagus and recurrent laryngeal nerves to the subclavian artery is shown. In order to obtain a long length of the subclavian artery, the ligatures are usually placed just beyond the initial branching. In the majority of cases the first branch of the subclavian is the vertebral artery. There is less danger of slipping of the ligatures if it and the subclavian are ligated separately. The subclavian artery is occluded proximally with a rubber-shod arterial clamp. The tips of the clamp are tied together in order to prevent slipping. The subclavian artery is then cut across proximal to the ligatures at its distal end.

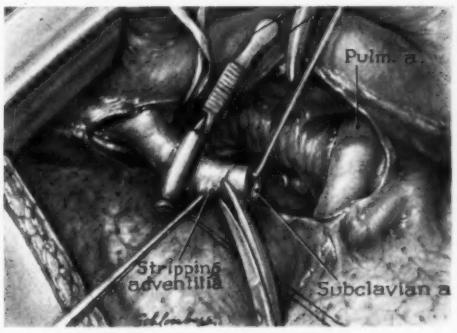


Fig. 10. The adventitia is removed from the end of the subclavian artery.

and the side or distal end of the right or left pulmonary artery; and (4) the side of the aorta and the side of one of the pulmonary arteries. The type of anastomosis which is chosen should be suited to the case in question. In general, we prefer an anastomosis between the proximal end of the subclavian branch of the innominate artery and the side of one of the pulmonary arteries. The reason for this is that the subclavian branch of the innominate artery when transposed makes a much more satisfactory angle with its parent vessel than is present when the subclavian branch of the aorta is used. Since this is the method which we prefer in the majority of instances, the steps of the procedure will be described and illustrated.

The side on which the aorta descends is determined preoperatively by the method of Bedford and Parkinson. If the aorta descends on the left, the innominate artery is on the right; if the aorta descends on the right, the innominate is on the left. Since we are desirous in most cases (with exceptions to be noted later) of using the subclavian branch of the innominate, the incision in the chest is made on the side opposite to that on which the aorta lies. This means in the majority of cases in our experience that the incision is made on the right. With the patient lying on his back and with the side to be operated upon somewhat elevated, an incision is made extending from the sternal margin to the midaxillary line. In the female the incision is made below the breast. Whereas formerly the incision into the pleural cavity was made through the third interspace, it is now usually made through the second interspace except in infants when the third is chosen. The higher incision results in less interference with inflation of the lung and gives better exposure of the apex of the pleural cavity. A costal cartilage may or may not be

Fig. 11. The right pulmonary artery is occluded proximally by an especially devised rubber-shod clamp which has a long handle and which operates by a screw mechanism. Distal occlusion is produced by an ordinary rubber-shod arterial clamp. A transverse opening is made on the upper surface of the pulmonary artery. This opening should be a little larger than the end of the subclavian artery. If the pulmonary artery is quite small, it may be advisable to make the opening into it in a longitudinal direction.

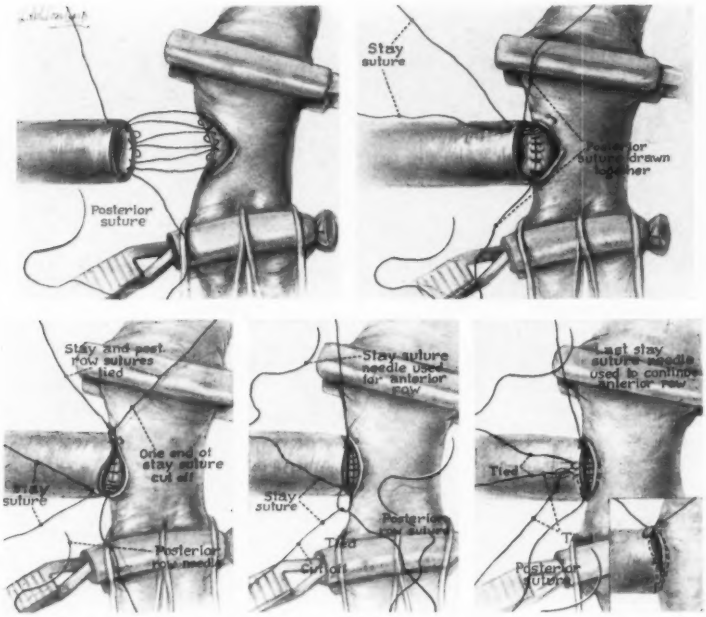


Fig. 12. Showing the steps of the anastomosis, reading from left to right, first above and then below. Deknatel sutures No. ooooo are used. The type of suture is an everting continuous one which includes the entire thickness of the wall of the artery. The intima is turned outward. The space separating each "bite" in the vessel is approximately 1 millimeter. The posterior row is placed before it is drawn taut. The ends are then tied to stay sutures. The anterior row is interrupted at one point. The anterior row is pulled taut as it is placed. Unlike the diagrams, very little silk is visible on the interior of the blood vessels.

divided. The following 8 illustrations (Figs. 6-13) picture the procedure when an anastomosis is performed between the proximal end of the subclavian branch of the innominate artery and the side of the right pulmonary artery. The position of the patient on the operating table and the location of the right pulmonary artery area and the azygos vein are shown in Figure 6. The next figure (Fig. 7) represents the same region after ligation and division of the azygos vein and exposure of the right pulmonary artery. After exposure of the right pulmonary artery, dissection is carried out just beneath the superior vena cava, and the innominate artery together with its branches, the right common carotid artery and the right subclavian artery, is exposed (Fig. 8). The right vagus and recurrent laryngeal nerves mark the position of the right subclavian artery. The right subclavian artery is occluded proximally with a rubber-shod clamp; it is ligated distally at its point of division and is cut across proximal to the ligature (Fig. 9). The adventitia is then removed from the end of the subclavian artery (Fig. 10). At this stage the operation is usually interrupted for several minutes and the lung is inflated. Following this rest period the right pulmonary artery is occluded proximally with a rubber-shod instrument with a long handle and is occluded distally with a bulldog clamp. A transverse opening slightly larger than the end of the systemic vessel is made between the points of occlusion on the upper surface of the pulmonary artery (Fig. 11). An anastomosis is then performed between the end of the subclavian artery and the side of the pulmonary artery by the use of No. ooooo Deknatel su-

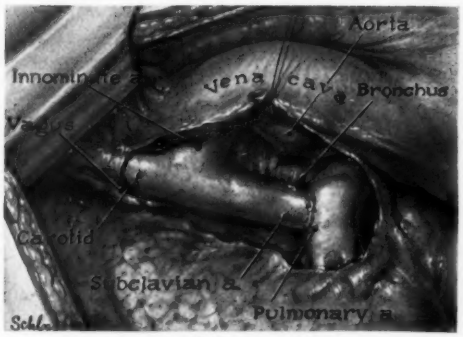


Fig. 13.

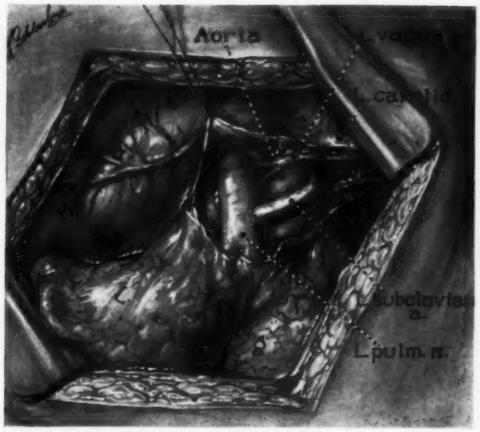


Fig. 14.

Fig. 15.

Fig. 13. Showing the completed anastomosis. The constricting devices were removed first from the pulmonary artery and subsequently from the subclavian artery. The transposed subclavian artery makes an excellent angle with its parent vessel, the innominate artery.

Fig. 14. Showing an end-to-side anastomosis between the left subclavian artery (branch of aorta) and the side of the left pulmonary artery. In contrast to the use of the subclavian branch of the innominate, this method has the disadvantage that rather sharp angulation of the subclavian may occur at the point at which the subclavian arises from the aorta. On the other hand, the anastomosis is easier to perform and usually functions satisfactorily. When the lung is inflated at the completion of the procedure, the angulation is lessened. Furthermore, one may elevate the position of the pulmonary artery slightly by suturing the visceral pleura of the hilus of the upper part of the lung to the mediastinal pleura. We use this method in most patients over the age of 12 because difficulty may be encountered in approximating the subclavian branch of the innominate artery to the pulmonary artery. The left pulmonary artery lies at a slightly higher level than the right.

Fig. 15. Showing an end-to-end anastomosis between the proximal end of the right subclavian artery and the distal end of the right pulmonary artery. The most frequent indications for this type are (1) a very small pulmonary artery in which an end-to-side union would be less satisfactory, and (2) a short subclavian artery which it is difficult or impossible to approximate to the side of the pulmonary artery. A good end-to-end anastomosis is preferable to an imperfectly performed end-to-side union. In the performance of the anastomosis, three or four guide or stay sutures are placed and these are connected by continuous sutures which evert the intima.

tures. The suture is one which everts the intima of the vessels. The procedure is rendered easier if the posterior suture line is placed before it is drawn taut (Fig. 12). After it has been drawn together, the two ends of the posterior row are anchored to stay sutures placed in mattress fashion. The anterior row of sutures, which may be interrupted at one or more points, is then placed and tied. After the anastomosis has been completed the various constricting devices are removed (Fig. 13).

It should be noted that the transposed subclavian artery makes an angle of about 90 degrees with the innominate artery and that there is no impediment to the flow of blood. Following the establishment of the anastomosis the color of the patient usually improves strikingly and a continuous thrill can be felt in the pulmonary artery. If one uses care and patience in freeing long lengths of the pulmonary artery and the innominate and its branches, one will rarely have difficulty in performing a satisfactory anastomosis between the subclavian branch of the innominate artery and the pulmonary artery in patients between the ages of 2 and 13 years.

It has been stated previously that the innominate artery arises on the left when the

Fig. 16. Showing a child in whom an anastomosis between the proximal end of the right subclavian artery and the side of the right pulmonary artery was performed 27 months after an anastomosis between the proximal end of the left subclavian and the distal end of the left pulmonary artery. It was gratifying to note that the child withstood temporary occlusion of the right pulmonary artery after the left pulmonary had been divided. This patient is doing very nicely.

aorta descends on the right and that the position can be determined preoperatively. Under such circumstances the incision is made on the left and the subclavian branch of the innominate artery is used. This operation is usually easier than a similar procedure on the right.

In the first operation which I performed for pulmonic stenosis, an anastomosis was made between the left subclavian artery, which arose directly from the aorta, and the side of the left pulmonary artery. Although such an anastomosis generally functions properly, the altered position of the subclavian artery usually results in rather sharp angulation at the point at which the artery arises from the aorta. The nature of the angulation is shown in a slightly exaggerated form in Figure 14. I wish to emphasize the point that such an anastomosis usually functions satisfactorily and that this procedure is usually easier technically than a union between the right subclavian branch of the innominate and the side of the right pulmonary artery. This is because the dissection and exposure are easier and the left pulmonary artery occupies a slightly higher position than the right. In fact, we generally perform an anastomosis between the left subclavian and the left pulmonary artery in patients who are older than 12 years of age and who have attained most of their growth and in whom there may be difficulty in approximating the right subclavian to the right pulmonary artery. This is done despite the fact that it is not as ideal a procedure as the use of the right subclavian branch of the innominate. In expressing a preference for the use of the subclavian branch of the innominate over that of the subclavian which arises directly from the aorta, I realize that Murray, Paine and Varco, Holman, and others generally utilize the subclavian artery which arises directly from the aorta, and that they are obtaining excellent results.

In the earlier phases of this work we frequently thought it necessary or advisable to use the innominate or the carotid artery for the anastomosis for the reason that the subclavian artery was regarded as too short or too small. With added experience it has been found that a short subclavian artery can generally be used if the pulmonary artery and the systemic vessel in question are dissected free of the surrounding tissues and adequately mobilized. In mobilizing the right or left pulmonary artery, the dissection should be extended well beyond the initial point of branching. If one can perform the anastomosis by using the subclavian branch of the innominate, there will not be too much tension on the suture line postoperatively. Inflation of the lung after the anastomosis is completed causes it to rise somewhat in the chest and reduces tension. In other words, the limiting factor in an anastomosis is the difficulty in approximating the structures while the union is being performed and not the fear of postoperative separation of the suture line. In some of the earlier operations we frequently underestimated the size of the subclavian artery and used another vessel when the subclavian would probably have sufficed. When tension is made on the

undivided subclavian artery, it is narrowed at the point at which the subclavian artery and recurrent laryngeal nerve pass over it and appears smaller than is the actual case. There is, however, an occasional patient in whom we are unable to anastomose the subclavian branch of the innominate to the side of the pulmonary artery despite the employment of various maneuvers. Under such circumstances one may divide the pulmonary artery and do an anastomosis between its distal end and the subclavian artery, or one may choose the innominate or the carotid artery for union to the side of the pulmonary artery. If the pulmonary artery is not more than two or three times the size of the subclavian artery, I prefer the use of this vessel and the end-to-end anastomosis because of the fear of cerebral complications when using the carotid or the innominate artery. The results following a good end-to-end anastomosis (Fig. 15) are almost as satisfactory as those following an end-to-side union. If the pulmonary artery is fairly large or if for other reasons it is impossible or inadvisable to use the subclavian artery in an end-to-end or end-to-side anastomosis, I think that one is warranted in using the innominate or the carotid artery despite the added risk. A long length of the carotid artery is readily available. In most instances in which the carotid has been used, the subclavian had already been ligated. In two operations performed by Dr. Longmire it was determined at the outset that it would probably be impossible to use the subclavian artery, and the carotid was ligated without disturbing the subclavian artery. It would seem that preservation of the subclavian and its vertebral branch would reduce the chances of cerebral complications in connection with ligation of the carotid artery.

If the right or left pulmonary artery is definitely smaller than the subclavian artery, it is advisable to divide the pulmonary artery as near its point of origin from the main vessel as possible and to perform an anastomosis between its distal end and the end of the subclavian artery. If one attempts an end-to-side procedure and fails, one has lost valuable length of the pulmonary artery. Furthermore, a good end-to-end anastomosis is to be

Fig. 17. Showing the method of Potts, Smith, and Gibson of performing an anastomosis between the side of the aorta and the side of the left pulmonary artery. This ingenious clamp allows the anastomosis to be performed when the aorta is only partially occluded, thereby obviating the likelihood of paralysis of the legs. The union of intimal surfaces is not as exact as when a branch of the aorta is used and one should take care not to make the opening too large. It is my opinion that this method is particularly valuable in the treatment of infants with pulmonic stenosis in whom the subclavian artery is too small to conduct an adequate quantity of blood to the lungs. This method is difficult to use if the aorta descends on the right.

preferred to a fair end-to-side union. As was stated previously, the results following an end-to-end anastomosis are usually good. I formerly thought that it would be impossible to do a second operation on the opposite side, should such become necessary, if the original operation had consisted of an end-to-end anastomosis. That this is not true is proved by a recent case in which an anastomosis between the end of the right subclavian and the side of the right pulmonary artery was performed 27 months after an operation on the left side in which the end of the left subclavian was anastomosed to the end of the left pulmonary artery. At the time of the first operation the child was 8 months old, the action of the heart was very poor, and the left pulmonary artery was small. Some improvement followed the first operation but it was not adequate. At the second operation the patient's circulatory system withstood temporary occlusion of the

right pulmonary artery despite the fact that the left had been divided, and the postoperative improvement is dramatic. A photograph of the child after the second operation is given in Figure 16.

In our initial publication on the surgical treatment of pulmonic stenosis Dr. Taussig and I (4) enumerated a number of methods by which the blood flow to the lungs could be increased. Among these was an operation in which the side of the aorta is anastomosed to the side of the left pulmonary artery. It was stated: "The third possible operative procedure is concerned with an anastomosis of the side of the aorta to the side of the left pulmonary artery. That such a procedure is possible in dogs has been shown by Leeds in his studies on patent ductus arteriosus. We considered the use of this method in our patients but were discouraged by the experience of Blalock and Park in studies on experimental coarctation of the aorta. We were fearful of causing a paralysis of the lower extremities and hence did not use this method with our patients. Another difficulty associated with the use of the aorta is that its walls are thick and rather friable and it is difficult to obtain an accurate approximation of the intimal surfaces." I think that the last objection to the use of the aorta still holds, but the danger of paralysis has been largely removed by Potts, Smith, and Gibson by the development of an ingenious clamp with which the aorta can be partially occluded while a side-to-side anastomosis to the left pulmonary artery is being performed. The employment of this clamp is illustrated in Figure 17. Although I realize that the Potts clamp may be utilized in performing anastomoses in patients of all ages, it is my opinion that its greatest field of usefulness is in infants in whom the subclavian artery is very small. It is my impression, and it is only an impression, that an aortic-pulmonary artery anastomosis places a greater strain upon the heart than a communication of the same size between a branch of the aorta and the pulmonary artery. There are many cases in which the pulmonary artery is too small for a satisfactory anastomosis with the side of the thick walled aorta. The use of the aorta is usually accompanied by the sacrifice of a larger number of collateral arterial pathways to the lungs than is the case when one of the aortic branches is employed. Even though one prefers to utilize the subclavian artery, everyone who is doing this type of surgery should have the Potts clamp available. For example, if one makes an incision on the left in an adult with the idea of using the subclavian branch of the aorta, one may decide to do an aortic anastomosis if for some reason the subclavian artery is unsatisfactory.

The principle underlying all of the operative procedures which have been mentioned is the same; namely, by-passing the point of stenosis in the pulmonary artery and allowing poorly oxygenated blood in the aorta to pass through the lungs. The surgeon performing this type of work should be thoroughly familiar with the anatomy of the region, should be able to do end-to-side, end-to-end, and side-to-side anastomoses, and should be able to use the subclavian artery, the carotid artery, the innominate artery or the aorta according to indications. The same procedure does not fit all cases. As I stated previously, the subclavian artery may be too small or too short. The aorta is not suitable if the pulmonary artery is very small in size. Obviously, under such conditions one could perform a better anastomosis by using a smaller, thinner walled vessel such as the subclavian artery.

There is always a systemic vessel which can be used for the anastomosis. The limiting factor is the pulmonary artery. If there is no pulmonary artery or if the artery is diminutive in size, one is obviously defeated. The size of the aorta and its branches varies greatly. Some small children have large systemic arteries; when this is the case, the pulmonary artery is apt to be small.

A later section of this paper will deal with anomalies of the blood vessels. At this point it should be emphasized again that one should know preoperatively the position of the aorta for this is of importance in determining the side on which the operation is performed. If the aorta descends on the right, and one wishes to use the subclavian branch of the innominate, the incision is made on the left. If the aorta descends on the right and one wishes to use the aorta, obviously the incision is made on the right.

There are several reasons for our preference not to operate upon infants under the age of 2 and for the present policy of not advising operation in infants if it is thought that there is a 50 per cent chance that the infant will survive to be 2 years of age or older. Among the reasons are the facts that it is more difficult to be certain of the diagnosis in infants, that the operative mortality is higher, and that the anastomosis has by necessity to be a rather small one. Even though the aorta is used, one does not dare to make a large communication between the two vessels in infants because of the danger of causing heart failure. It is not known whether the anastomosis increases in size with the growth of the vessels. It seems likely that some of the patients operated upon in infancy will have to have a second operation at a later date.

The present ideas in regard to the type of operation as related to the age and size of the patient are roughly as follows:

A. Patients under 2 years of age.
   1. Do not operate if the chances of survival to 2 years of age are 50 per cent or better.
   2. Make the incision on the side on which the aorta descends. Use the subclavian artery if it appears large enough. If not, perform side-to-side anastomosis between the aorta and the pulmonary artery.

B. Patients 2 years to 13 years of age.
   1. Make the incision on the side opposite to that on which the aorta descends. The preferred anastomosis is between the subclavian branch of the innominate and the side of the pulmonary artery.
   2. If the pulmonary artery is very small, do an end-to-end anastomosis between the subclavian artery and the distal end of the pulmonary artery.

C. Patients more than 12 years of age or more than 5 feet in height or both 12 years of age and 5 feet in height.
   1. If the aorta descends on the left, make the incision on the left. Perform by preference an anastomosis between the subclavian branch of the aorta and the side of the left pulmonary artery. If this is impossible and if there is not too great discrepancy in the sizes of the subclavian and pulmonary arteries, perform an end-to-end anastomosis. An alternative method is an anastomosis between the side of the aorta and the side of the left pulmonary artery.
   2. If the aorta descends on the right, make the incision on the left and use the subclavian branch of the innominate artery for the anastomosis. This blood vessel is usually a long one and furthermore the left pulmonary artery is usually at a higher level in the chest than the right pulmonary artery.

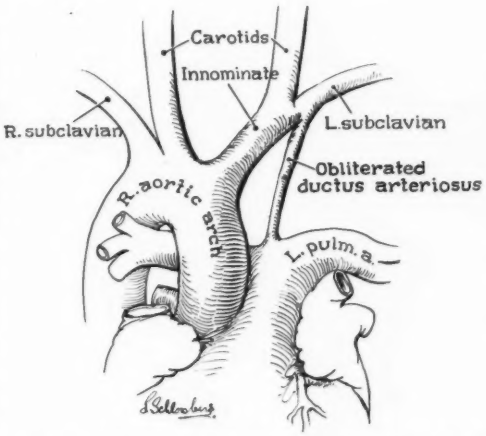


Fig. 18. Showing a right aortic arch with an aorta which descends on the right. The position of the descending aorta is of importance from a surgical standpoint in that it determines the side on which one makes the incision. The innominate arises on the side opposite to that on which the aorta descends. In most of the cases in which the aorta descends on the right there is an obliterated ductus arteriosus which connects the pulmonary artery with the first portion of the left subclavian artery.

ANOMALIES OF THE BLOOD VESSELS

This description of blood vessel anomalies is by no means all inclusive. It is simply a brief account of some of the anomalies, most of which have been observed in the course of operations on our patients.

Right aortic arch. If the aorta arches to the right and descends upon the right, the condition is termed a right aortic arch. The three major vessels which arise from the arch of the aorta are the mirror image of normal; that is, the innominate artery arises first and passes toward the left, the right common carotid arises next, and the right subclavian artery last. The condition places no undue strain on the heart and is usually of importance only in that it may influence the side upon which the operation for pulmonic stenosis or atresia is performed. By and large the easiest anastomoses which we have performed are in patients with a right aortic arch because the left subclavian branch of the innominate is usually a

Fig. 19. Showing a double aortic arch or aortic ring. The patient died suddenly on the fourteenth postoperative day after the creation of an artificial ductus for pulmonic stenosis.

long vessel and can be approximated to the left pulmonary artery without difficulty. As stated previously, the presence of a right aortic arch can be determined by the method of Bedford and Parkinson. Dr. Taussig and her associates have been in error as to the position of the aorta in only 2 or 3 of our cases.

A right aortic arch occurs so often that perhaps it should not be regarded as an anomaly. It has been found in 144 of the 610 cyanotic patients upon whom we have operated. It has been surprising that the incidence is so high in view of the fact that the late Dr. Maude Abbott found only 35 cases in an analysis of autopsies on 1,000 cases of congenital heart disease. In 14 of these the right aortic arch was the "primary" lesion whereas in 21 cases it was associated with other defects.

In approximately three-fourths of the patients with a right aortic arch upon whom we have operated there has been an obliterated ductus arteriosus connecting the first part of the left subclavian branch of the innominate to the pulmonary artery. This is a long fibrous structure which in some instances has a small lumen at either the systemic or the pulmonic end. This has been a surprising observation in view of the belief that in a right aortic arch the sixth right branchial arch distal to the pulmonary artery persists as the ductus arteriosus. The usual finding in our cases is shown in Figure 18. In our experience with the right aortic arch the ductus has not always been on the left, and furthermore Dr. John Jones has operated upon a patent ductus on the right in a patient with a right aortic arch.

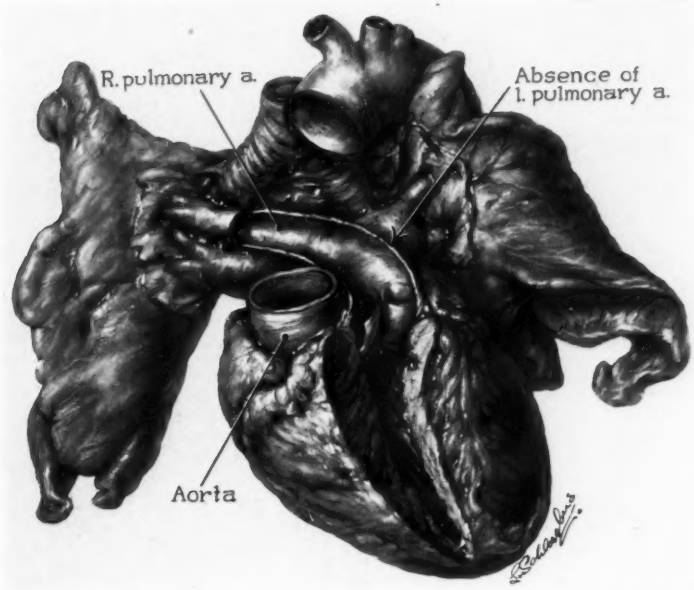


Fig. 20. Autopsy specimen showing a pulmonary artery to only one of the lungs. Such a condition should be suspected as a result of preoperative studies and the observations at the time of operation.

In some instances the aorta arches to the right but then turns sharply to the left and descends on the left. This is known as a right aortic arch with a left descending aorta. Under such conditions the aorta lies behind the esophagus and is called a retro-esophageal aorta. The point of origin of the arteries from the arch is variable. In some cases the left subclavian artery arises from the descending aorta.

A patient was operated upon recently who had the rare combination of a left aortic arch, a retro-esophageal aorta, and a right descending aorta. This case is being reported by Dr. R. N. Paul.

In a patient with dextrocardia the aorta may descend on the right or the left. This statement is true whether there is or is not a complete situs inversus. Dr. Taussig has found that a left aortic arch occurs in a high percentage of patients with dextrocardia. From the surgical standpoint the important fact to remember is that the innominate artery arises on the right when the aorta descends on the left and on the left when the aorta descends on the right. Furthermore, the prognosis should be very guarded in patients with dextrocardia, particularly if there is not situs inversus. Additional malformations of the heart and blood vessels are likely to be present.

It should be emphasized that these observations on the aortic arch are largely of academic interest except as the position influences the site from which the large vessels arise and hence the side on which the incision is made. It is true that patients with abnormal position of the great vessels may have dysphagia lusoria, but this was not encountered in this series of patients.

Double aortic arch. A double aortic arch or aortic ring is a rare malformation. The aorta arches to the right and descends on the left. It occurs as a result of the persistence of both the right and the left fourth aortic arches as functioning tubes. Thus the double aorta encircles the trachea and the esophagus. The origin of the great vessels from the double arch is variable.

Fig. 21. Showing the right subclavian in a position posterior to the trachea and esophagus. The position can be determined by inspection and palpation. Furthermore, the fact that the vagus nerve does not pass across the subclavian artery leads one to suspect an abnormal position.

Fig. 22. Showing the transposed position of the retro-esophageal subclavian artery. In most instances in which this anomaly was encountered the subclavian artery has not been brought out anterior to the trachea and esophagus.

I am aware of only one patient with a double aortic arch in association with the tetralogy of Fallot upon whom I have operated, and the double aortic arch was not recognized at the time of operation. An anastomosis between the end of the right subclavian artery and the side of the right pulmonary artery was performed on this 20 year old girl from France. She did well in the early postoperative period, but died suddenly of what was thought to be a cerebral embolus on the fourteenth postoperative day. At autopsy a large thrombus in the left ventricle was seen. The double aortic arch is shown in Figure 19. It is very likely that an aortic ring was present in a few of the other patients in whom an artificial ductus was created.

Single pulmonary artery. Observations at the time of operation or autopsy in 9 of the patients indicate that there was a pulmonary artery to only one of the two lungs. Such a finding should be suspected in preoperative studies in which the vascular markings on the one side are less pronounced than those on the opposite side. Furthermore, the condition should be suspected at the time of operation

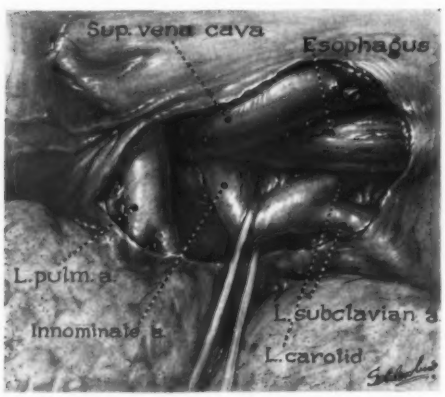


Fig. 23. Showing a retro-esophageal innominate artery on the left.

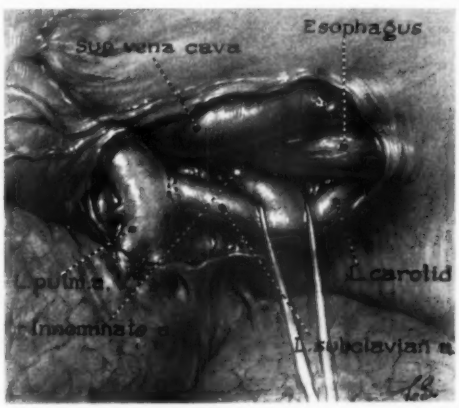


Fig. 24. Anastomosis between subclavian branch of a retro-esophageal innominate and left pulmonary artery.

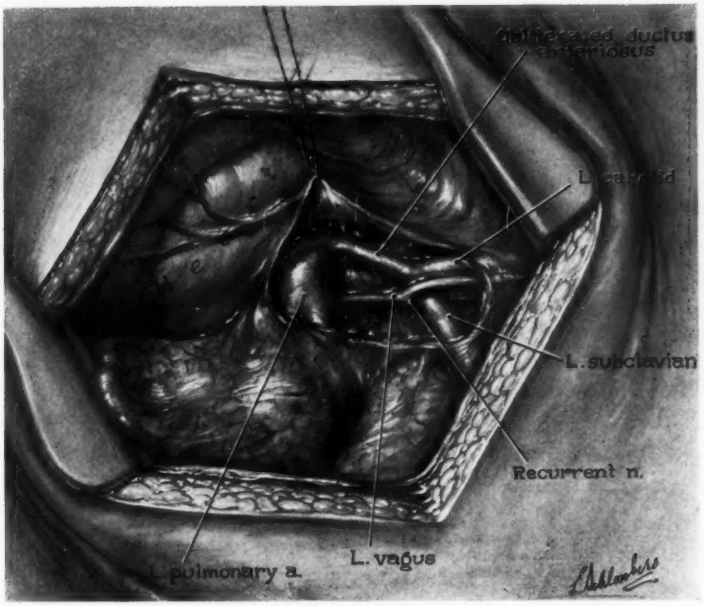


Fig. 25. The condition in a patient who had a right aortic arch and in whom the incision was made on the left is shown. In approximately the position in which the innominate artery should have been located there was an obliterated cord which connected the junction of the left subclavian and left carotid arteries with the pulmonary artery. Palpable arterial pulsations were present in the subclavian and carotid arteries.

if the action of the heart becomes impaired during temporary occlusion of the right or left pulmonary artery or if the pressure in the pulmonary artery rises noticeably during the occlusion period. If the collateral circulation to the lungs is well developed, a patient with a single pulmonary artery may withstand occlusion of this vessel for a sufficiently long time to allow for the performance of an anastomosis. It is doubtful, however, if the risk is warranted if the presence of a single pulmonary artery is strongly suspected. The condition seen at autopsy in a patient who had a single pulmonary artery is shown in Figure 20.

Retro-esophageal subclavian artery. This anomaly has been observed in 26 patients. In 12 of these the operation was being performed on the right side. In none of these was there a history of difficulty in swallowing. In a number of the patients an abnormality in position of the subclavian artery was suspected preoperatively because of a slight deformity of the esophagus as observed on the x-ray film after the swallowing of barium. In most of the cases in which a retro-esophageal subclavian artery was found the anastomosis

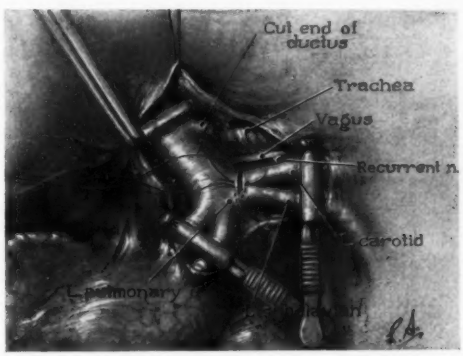


Fig. 26. Showing an anastomosis between the junction of the left subclavian and carotid arteries (Fig. 25) and the left pulmonary artery. The patient improved strikingly after operation.

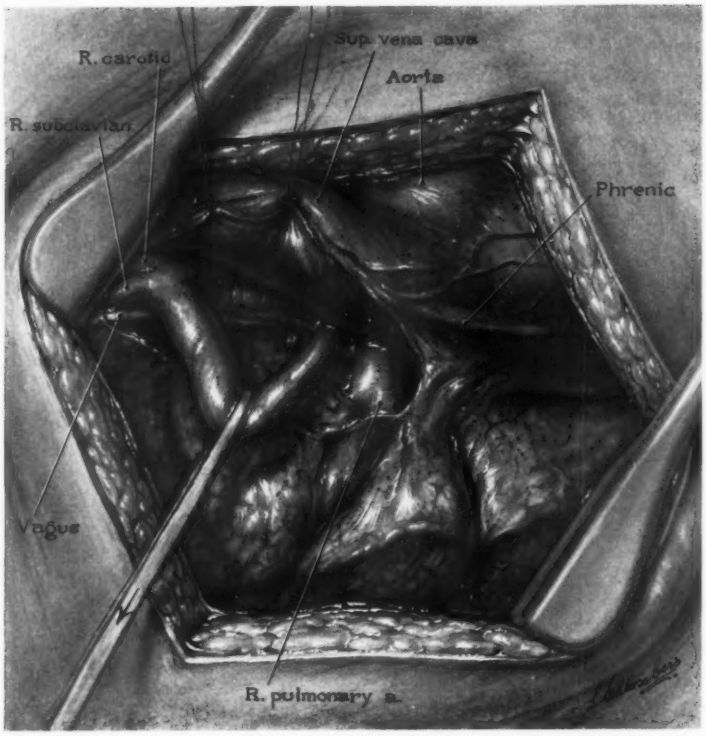


Fig. 27. Showing a large unidentified vessel on the right which was thought to be a ductus arteriosus. It arose from the innominate and was almost as large as the innominate. It became progressively smaller as it approached the pulmonary artery area. The flow of blood was from the innominate end. Patency of the opposite end was not demonstrated.

between it and the pulmonary artery was performed without altering essentially the position of the subclavian. In several instances the right subclavian artery was delivered to the left of the right bronchus and the esophagus after it had been divided distally and the anastomosis was performed anterior to these structures. Diagrams of the preoperative and postoperative positions in one of these patients are shown in Figures 21 and 22. In any case the retro-esophageal location of a subclavian artery is not a deterrent to the performance of a satisfactory anastomosis. The wall of a retro-esophageal subclavian artery is thinner than that of the same vessel in a normal position.

Retro-esophageal innominate artery. A retro-esophageal innominate artery has been observed in only one of our patients. The abnormal position of this blood vessel presented no unusual difficulties in the creation of an artificial ductus arteriosus. The condition at the time of operation, before and after the performance of the anastomosis, is shown in Figures 23 and 24.

Absence of innominate artery. The four great vessels, the two subclavian arteries and the two common carotid arteries, may arise directly from the aorta, in which case the innominate artery is absent. The opposite extreme is found in cases in which both common carotid arteries as well as one of the subclavian arteries arise from the innominate. The identity of the great vessels must be determined with care at the time of operation, and the surgeon should ask the anesthetist to ascertain

Fig. 28. Anastomosis between the unidentified vessel shown in the previous figure (probably a ductus arteriosus) and the right pulmonary artery.

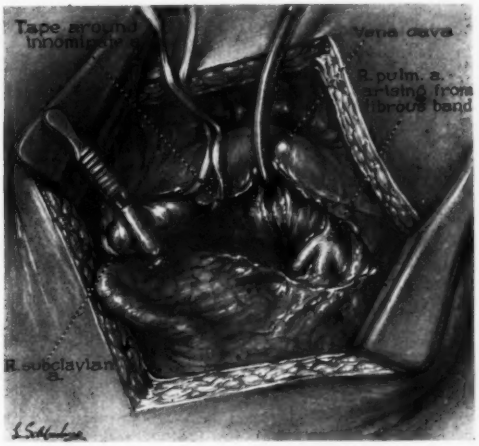


Fig. 29. Showing a functional truncus arteriosus with a blind right pulmonary artery. Subsequent autopsy did not disclose a pulmonary artery on the left. The circulation to the lungs was entirely through collateral arterial channels.

the effect on the peripheral pulse of temporary occlusion of the blood vessel under consideration for ligation. In this way the unnecessary use of one of the carotid arteries may be avoided.

An unusual anomaly in which the presence of an innominate artery was not demonstrated is shown in Figure 25. A band of fibrous tissue without a lumen connected the junction of the left common carotid artery and the left subclavian artery with the pulmonary artery. This patient had a right aortic arch; hence the innominate artery should have been on the left. Pulsations were palpable in the carotid and subclavian arteries but the origin of the vessels was not determined. The performance of an anastomosis between the junction of these arteries and the left pulmonary artery resulted in definite improvement in the patient (Fig. 26).

Unusual ductus arteriosus. It was the consensus among us that the large blood vessel shown in Figure 27 was a ductus arteriosus which was obviously patent at the innominate end and which may or may not have been patent at the opposite end. The innominate

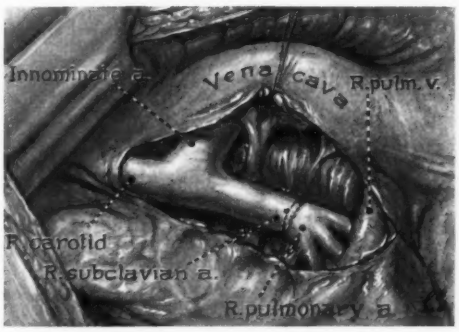


Fig. 30. Showing an anastomosis between the right subclavian artery and the patent distal end of the pulmonary artery shown in the previous figure. The patient, who died as the anastomosis was being completed, should have been greatly improved if the operation had been tolerated.

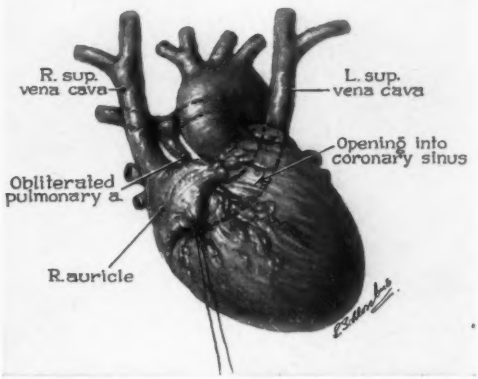


Fig. 31. Showing the presence of bilateral superior venae cavae, a frequent anomaly. The entrance of the left superior vena cava into the heart is variable.

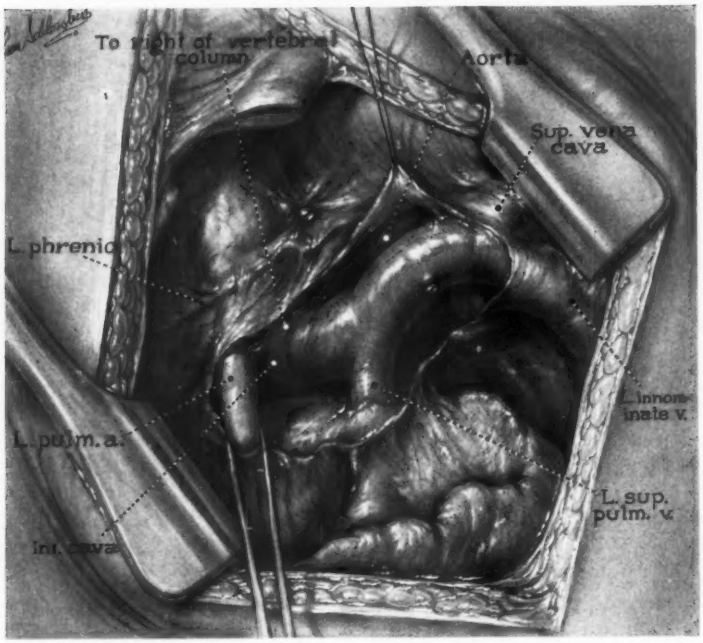


Fig. 32. This interesting anomaly shows the superior and inferior venae cavae on the left and the left superior pulmonary vein entered approximately at the junction of these vessels.

end of this vessel was only slightly smaller than the innominate artery itself and it became progressively smaller as it approached the region of the base of the heart. The pulsating stream of blood originated from the innominate end of the vessel. Even though we could not be certain as to the point of attachment or the lack of patency of the opposite end of the vessel, it was cut across and an anastomosis to the right pulmonary artery was performed (Fig. 28). The patient showed striking improvement following the operation.

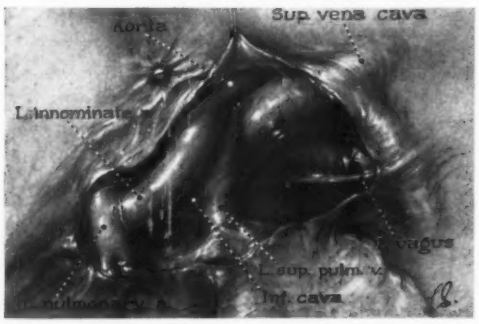


Fig. 33. Showing an anastomosis between the left innominate artery and the left pulmonary artery in the presence of the anomaly shown in the previous figure. Under such conditions the transposed artery should not be placed in such position that it will press upon the vein.

Functional truncus arteriosus with blind pulmonary artery. Several patients have been operated upon in whom the pulmonary artery did not connect with the heart or the aorta. The circulation to the lungs was by way of collateral vessels, usually bronchial arteries. An example of this condition is illustrated in Figure 29. An end-to-end anastomosis was performed between the right pulmonary artery and the right subclavian artery, but unfortunately the heart's action ceased suddenly just as the union was completed (Fig. 30). Autopsy examination showed that there was no communication on either side between the pulmonary artery and the heart or aorta and

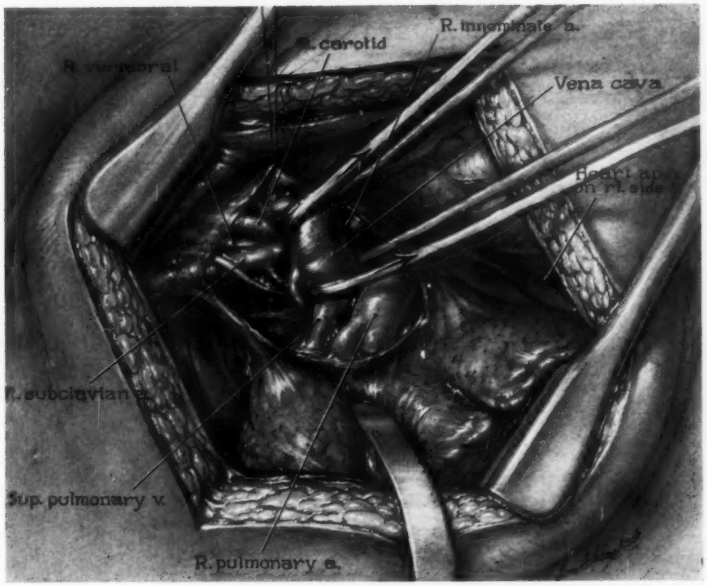


Fig. 34. Showing an anomalous position of the superior vena cava. The superior pulmonary vein entered the superior vena cava.

that the circulation to the lungs was through collateral vessels. The patient should have been greatly improved if the operative procedure had been tolerated.

Bilateral superior venae cavae. The presence of bilateral superior venae cavae is not a rare anomaly. With the increased use of venography a surprisingly large number of cases have been discovered. Since exploratory thoracotomy exposes the contents of only one pleural cavity, it is difficult to make the diagnosis by operation alone. It is true, however, that a left superior vena cava has been observed in a number of the patients in whom the incision was made on the left. When bilateral superior venae cavae are present, both veins may open into the right auricle or one may enter the right and the other the left auricle, or one may enter the right auricle and the other the coronary sinus. An illustration depicting the entrance of the right superior cava into the right auricle and the left into the coronary sinus is shown in Figure 31.

Other anomalies of systemic veins. Other anomalies range from those in which both the superior and the inferior venae cavae enter the left auricle to minor variations in position of the various vessels. The presence of both the superior and the inferior venae cavae on the left as observed at the time of operation is shown in Figure 32. The site of entrance into the heart was not determined. It was noted that the left superior pulmonary vein entered these vessels. The type of arterial anastomosis which was performed is shown in Figure 33. It is important to place the systemic artery which is used for the shunt in such position that it will not press on the superior or inferior vena cava.

A peculiar position of the superior vena cava as observed in an operation on the right side is shown in Figure 34. The superior pulmonary vein emptied into this vessel. The anastomosis between the subclavian artery and the pulmonary artery is shown in Figure 35.

An anastomosis on the right side was made more difficult in a case in which the left innominate vein passed posterior to the innominate artery and almost circumscribed it (Fig.

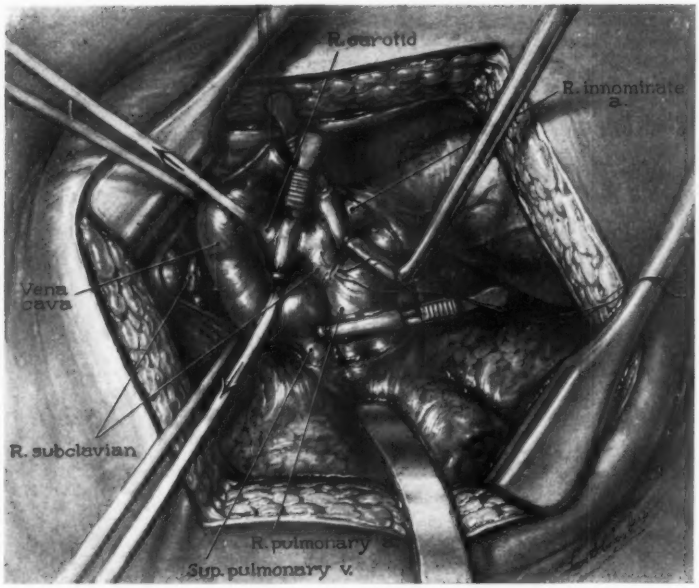


Fig. 35. Showing the anastomosis between the right subclavian artery and the right pulmonary artery in the presence of the anomalous position of the superior vena cava as depicted in Figure 34.

36). The completed anastomosis is depicted in Figure 37.

Anomalies of pulmonary veins. Some or all of the pulmonary veins may drain into the right auricle or its tributaries. Two such cases are shown in drawings in the preceding section. Despite the fact that no attempt was made to alter the site of the drainage in these cases at the time that an artificial ductus arteriosus was created, the patients have improved greatly.

Brody, Brantigan, and others have reported similar anomalies of the pulmonary veins and have reviewed the literature. With further improvement in diagnostic methods and surgical technique, some of these anomalies can probably be treated successfully by operation.

TREATMENT AND RESULTS

The preoperative and postoperative care of most of the patients is not very difficult or complicated. Digitalis is recommended before operation for patients in whom the cardiac reserve is low. The removal of blood by venesection is seldom if ever indicated. Care should be exercised in the preoperative period to see that the patient does not become dehydrated because of the possibility that cerebral thrombosis may occur. A child should receive at least 1,600 cubic centimeters of fluid per diem and an adult at least 2,200 cubic centimeters per diem. The administration of penicillin should be begun before or shortly after the operative procedure.

The total quantity of fluids administered during the operation should equal approximately the loss of blood during the procedure. Unless blood loss is excessive, the fluid is given in the form of plasma. If severe bleeding occurs, whole blood is administered. If the pulse rate should become alarmingly slow, additional atropine is given.

All patients are placed in an oxygen tent on being returned to their rooms. Venesection is rarely performed. Aspiration of the pleural cavity on one or more occasions is performed in at least half of the cases. The administration of whole blood is indicated if a large accumula-

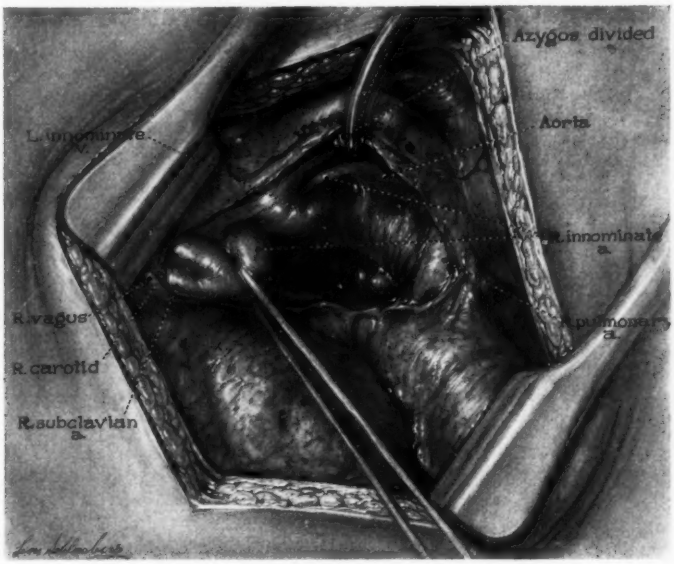


Fig. 36. Showing an anomalous position of the left innominate vein in which it lies posterior to the innominate artery.

tion of blood in the pleural cavity occurs. The problem as to the quantity of fluid other than blood which should be given is a delicate one. The quantity should be sufficient to reduce the likelihood of cerebral and anastomotic thrombosis and should not be sufficient to cause pulmonary edema and heart failure. In general, the total fluid intake each 24 hours in the early postoperative period should be 700 to 900 cubic centimeters in infants, 1,000 to 1,400 cubic centimeters in children, and 1,800 to 2,200 cubic centimeters in adults. If evidence of cerebral thrombosis or occlusion of the anastomosis appears, the administration of heparin is indicated. It is important to bear in mind that these patients need rest in the postoperative period and that they may be "overtreated" as well as "undertreated."

My associates and I have operated upon 610 cyanotic patients who were believed as a result of preoperative studies by Dr. Taussig, Dr. Bing, and others to have an inadequate flow of blood to the lungs. With the exception of 15 patients who were operated upon in Guy's Hospital in London and Hôpital Broussais in Paris, the operations were performed in the Johns Hopkins Hospital. A second anastomosis has been carried out on several of the patients. The total number of patients who have died is 108, an overall mortality rate of 17.7 per cent. Twenty-seven of the deaths occurred during the operation, 68 in the postoperative period, and 13 after discharge from

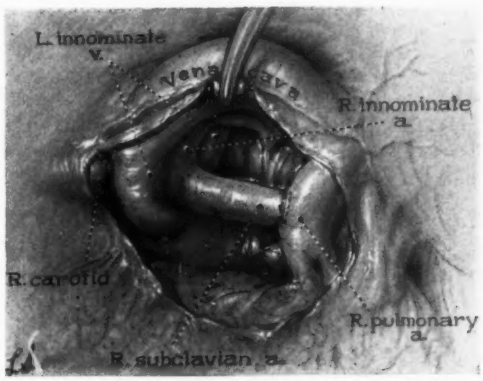


Fig. 37. Showing the relationship between the subclavian-pulmonary arterial anastomosis and the innominate vein as demonstrated in Figure 36.

the hospital. No known deaths are excluded. Some of the patients did not have a pulmonary artery which was suitable for anastomosis and death followed simple exploratory thoracotomy. The diagnosis was in error in some fatal cases; 7 of these patients had a transposition of the aorta and pulmonary artery. A few of the deaths were unrelated to the operative procedure; for example, a child from France died of meningitis after returning home.

Twelve of the 27 deaths which occurred during operations were in the course of exploratory thoracotomies. In some of these instances the pulmonary artery was absent or was not suitable for an anastomosis. Six of the patients died while an anastomosis was being performed, and 9 succumbed shortly after the blood vessel union was completed. In some instances the exact cause of death was not determined, but it seems reasonably certain that the commonest cause of death during the operative procedure was cardiac anoxia.

Sixty-eight of the patients succumbed during the postoperative hospital period. In many instances the cause was not determined. The major cause or the contributing cause was thought to be cerebral thrombosis in 24 cases, cardiac failure or pulmonary edema in 16 cases, hemorrhage in 8 cases, thrombosis of the anastomosis in 5 cases, and respiratory complications in 3 cases. As was stated previously, autopsy examination did not explain the fatal outcome in a number of cases.

There have been 13 patients who died after discharge from the hospital from varied causes, some of which were not related to the operation. Included among the causes of death were heart failure, coronary occlusion, pneumonia, and cerebral accidents.

The mortality rate depends to a considerable extent upon the principles which one adopts in regard to operability. We have taken the position that almost all cyanotic patients who are believed to have an inadequate pulmonary blood flow and who are significantly incapacitated should be operated upon. The mortality rate in patients 2 years of age and older with a typical tetralogy of Fallot is low. We have had as many as 44 consecutive operations without a death. On the other hand, the danger is considerably greater when patients have associated complications such as rotation of the heart and cardiac arrhythmias. The ideal set of conditions on preoperative study and at the time of operation are a moderate reduction in pulmonary blood flow, a normal sized or only slightly enlarged heart, a large and long subclavian artery, a pulmonary artery of moderate size, few collateral arterial channels to the lungs, a high pressure in the aorta and its branches and a low pressure in the pulmonary artery, and a patient in the age group of 3 years to 10 years. On the other hand, a more unfavorable prognosis accompanies operations on patients with heart failure, arrhythmias, rotation of the heart, a greatly enlarged heart (cardiothoracic ratio 60+), or absence of a systolic murmur in the pulmonary area (suggestive of atresia). The outlook is particularly poor in infants.

An anastomosis between the proximal end of one of the subclavian arteries and the side of one of the pulmonary arteries has been performed in 433 patients who survived the termination of the operative procedure itself. In most of these the subclavian branch of the innominate was used. There were 45 deaths in the 433 cases, a mortality rate of 10.4 per cent. The diagnosis was in error in a few of the fatal cases. An anastomosis between the proximal end of a subclavian artery and the distal end of one of the pulmonary arteries was performed in 38 cases with 6 deaths, a mortality rate of 15.7 per cent. In most patients in this category the pulmonary artery was considered to be too small for a satisfactory end-to-side anastomosis.

Most of the cases in which the innominate or the carotid artery was used for the anastomosis were in the earlier part of the series. It is our opinion at present that it is rarely necessary to use one of these larger blood vessels; in the great majority of cases adequate mobilization of the arteries will allow one to use the subclavian artery. At any rate, the carotid artery has been employed for the anastomosis in 34 cases with 8 deaths, a mortality rate of 23.5 per cent, and the innominate in 49 cases with 15 deaths, a mortality rate of

30.6 per cent. There is no doubt that ligation of the innominate or the carotid artery exposes the patient to a greater risk of cerebral complications. It is only fair to state, however, that a number of the patients in this group were small, very sick children, and that part of the high mortality is ascribable to the poor general condition of the patients. A side-to-side anastomosis between the aorta and the pulmonary artery has been performed in only 2 cases with 1 death. In this fatal case the anastomosis was made too large and pulmonary edema developed. There were 24 exploratory thoracotomies with 4 deaths, no anastomosis being performed for various reasons.

The right or left subclavian artery has been ligated in approximately 555 cases. In most instances the ligatures were placed just distal to the point at which the vertebral artery arose, the subclavian and the vertebral being ligated separately. There has been no serious interference with the circulation of the arm in any of these patients. Sympathetic nerve block has not been used. The affected extremity is slightly cooler than the opposite one for a while and a radial pulse is absent for an extended period. There has been no discernible impairment in function of the arm and hand in any instance.

The majority of the patients who have survived the operative procedure are improved. The degree of improvement ranges from that observed in some patients who seem to have no further limitations in activity to those who have definite restrictions. The detailed results in the first 300 cases will be reported shortly by Dr. Ruth Whittemore. Most of the patients show improvement in the color of the mucous membranes as soon as the anastomosis is established, and blood studies demonstrate an elevation in the arterial oxygen saturation. During the following days and weeks the arterial oxygen saturation continues to rise somewhat and the oxygen capacity, the hemoglobin, the red blood cell count, and the packed cell volume decline. The clubbing of the fingers and toes usually recedes gradually. The pulse pressure generally becomes greater than that found in the preoperative period and a continuous murmur is heard in the precordial area. The most notable alteration, however, is the lessening of the patient's incapacity. Many of the patients in the postoperative period appear to be amazingly free of limitations. Some of the patients who could walk only a few steps before operation can now walk miles. It must be emphasized, however, that the time since operation has been too short to allow an evaluation of the final results.

SUMMARY

In this lecture in honor of Doctor Rudolph Matas the surgical procedures employed and the anatomical variations encountered in the treatment of 610 cyanotic patients with a preoperative diagnosis of pulmonic stenosis have been enumerated, considered, and illustrated. A brief account of the postoperative results has been given.

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BACTERIOLOGY OF THE VAGINA IN 75 NORMAL YOUNG ADULTS

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SINCE the development of newer bacteriological methods, few studies have been made of the organisms in the vagina of normal human adults. Topley and Wilson (21) discuss briefly the normal flora of the vagina after puberty, naming Doederlein's bacillus as the predominant organism and mentioning several other frequent inhabitants including staphylococci, streptococci, coliform bacilli, and diphtheroids.

In 1944 Rakoff analyzed the biologic characteristics of the vagina in 500 normal adults, 37 of whom were followed three times weekly through 1 to 3 menstrual cycles. In these, he correlated vaginal acidity with the conventional grades of vaginal flora: grade I, Doederlein's bacilli only; grade II, Doederlein's bacilli and other organisms; grade III, organisms other than Doederlein's bacilli. He concluded that the normal vaginal flora is associated with *p*H 3.9 to *p*H 6.1 and consists of lactobacilli only. However, he conceded that apparently normal vaginas may harbor other organisms, such as staphylococci, streptococci, diphtheroids, coliform organisms, and yeast-like forms.

The recent report of Hite, Hesseltine, and Goldstein (10) concerning 248 normal and pathologic patients does not classify the subjects as pregnant and nonpregnant. It therefore is not suitable for analysis of the flora in normal nonpregnant adults.

In 1936 Weinstein and his associates (25) made a survey of the vaginal flora at various ages in a group of 99 nongravid adults with marital introitus and with normal menstrual histories. Forty-five of these had leucorrhea and cervicitis, while 54 had normal vaginal tracts. In this group of 99, by examining smears, he divided the flora into three groups which differed from the conventional grades in that Doederlein's bacillus was included in group III as well as in groups I and II, and group III was distinguished from group II by the presence of diphtheroids. A similar classification could not be made from cultures. He listed the pelvic lesions associated with various bacteria but did not give the complete flora of any of the normal individuals.

In 1938 Weinstein (23) reported a study of 375 patients, including healthy, unhealthy, pregnant, and nonpregnant individuals. He could find no correlation between vaginal *p*H and the type of flora; nor could he group the flora into conventional grades.

Some of the organisms frequently cultured from the vagina have been studied in detail. Soule and Brown (17) reviewed the literature concerning anaerobic streptococci in the vagina, quoting positive cultures in 40 per cent of apparently normal women (Rosowski). The other studies reviewed as well as the series of Soule and Brown dealt with pregnant individuals.

Hite and Hesseltine (11) recently isolated 92 strains of streptococci from the vagina and uterus. This procedure, however, as well as their review of the literature deals chiefly with pregnant and postpartum patients.

Likewise, studies of staphylococci from the human vagina frequently are based on cultures from prenatal and postpartum patients. Weinstein's series (24) included 233 cases of nonpregnant women, with an incidence of 48.8 per cent cultures positive for staphylococci. From his total series of 419 individuals, he isolated 19 strains of staphylococci, many of which gave reactions suggestive of pathogenicity.

Surprisingly, the Doederlein bacillus, though considered the predominating vaginal organism, is of uncertain identity. Bergey's *Manual of Determinative Bacteriology* describes 15 defi-

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nite and 8 possible species of lactobacilli, but does not mention the vagina as a source for any of them. The description of Lactobacillus acidophilus corresponds fairly well with the characteristics usually ascribed to the Doederlein bacillus. Although Topley and Wilson use the term Doederlein's bacillus in discussing the vaginal flora, they state elsewhere (20) in the same text in discussing lactobacilli: "It seems probable that some species that have been called by different names are in reality identical. It seems likely that Doederlein's bacillus, for example, is the same as Lactobacillus acidophilus." The text of Jordan and Burrows recalls the old synonyms of Doederlein's bacillus: Bacillus vaginalis, and Bacillus crassus, and states that it is a "common constituent of the flora of the vagina." However, they dismiss a detailed discussion of it with the statement that it is "thought to be identical with Lactobacillus acidophilus." The term Doederlein's bacillus and its synonyms seem to be disappearing quietly from the newer editions of textbooks of bacteriology.

Independent investigators have conflicting views as to the identity of the vaginal lactobacillus. Thomas reviewed the conflicting ideas in the literature from the time of Doederlein's original description in 1891 until 1926. His own work in 1928 consisted of a study of the microscopic, cultural, and serological characteristics of organisms from 107 specimens obtained from normal vaginas, including 8 strains of lactobacilli. His final conclusion, based chiefly on agglutination reactions, was that Doederlein's bacillus is Lactobacillus acidophilus, and that "no new names for the vaginal bacilli are justified." Lash and Kaplan, however, believed that of their four strains of Doederlein's bacilli, two were identical with strains of Lactobacillus acidophilus, one with Corynebacterium segmentosum but that one, strain B, deserved the name *Lactobacillus vaginae*. Likewise, Brown and Redowitz reported serological differences between Doederlein's bacillus and Lactobacillus acidophilus.

Previous investigators of the vaginal flora have tended to concentrate their attention on the cultural characteristics of certain bacteria or to enumerate the complete range of organisms isolated without a clear division of their source from normal or abnormal subjects. A search of the literature fails to reveal a complete list of vaginal organisms obtained from a group of healthy women. Thus, the interpretation of vaginal cultures is confused by ignorance in regard to the range of physiological variations of the vaginal flora. The present investigation was prompted by the need to establish such a distinction in various age groups. The preliminary study to be reported is concerned with the vaginal organisms from a group of seemingly healthy young women.

METHODS

Material. Student nurses without signs or symptoms of gynecologic disease were used as volunteers. Ages ranged from 17 to 25 years. None were married. In several instances, the material was discarded because of technical difficulties such as contamination when the introitus was very small. The series to be reported consists of 75 cultures and smears.

Technique of obtaining material. The device used for obtaining cultures consisted of a cotton swab on a wooden applicator about 12 centimeters in length, contained in No. 7 glass tubing about 8 centimeters long. The bore was just large enough to allow free movement of the swab. The devices were kept in separate cotton-plugged glass test tubes of suitable length.

No perineal clean-up was used. The labia were parted widely in such a manner that pressure was directed toward the perineum, and the hymenal opening was made to gape. Through this opening the glass cylinder was passed well into the vagina without touching the introitus or lower vaginal walls. The swab was then pushed from its protected position inside the glass container and was carried 2 to 4 centimeters higher in the vagina. After the swab had been twirled a few times, it was withdrawn into the tube, and the tube withdrawn from the vagina. With the labia still separated, one end of a strip of nitrazine paper was then passed into the lower vagina and allowed to become moist. By comparing this with color charts, the *p*H was determined. This procedure was not carried out in 7 of the 75.

TABLE I.—VAGINAL ORGANISMS CULTURED FROM 75 UNMARRIED HEALTHY YOUNG WOMEN*

Organism	No. individuals from whom grown	Per cent total cases cultured
Lactobacilli	62	82.6
Diphtheroids	14	18.6
Streptococci	14	18.6
Staphylococci	10	13.3
Coliform	1	1.3
Unidentified rods	2	2.6
Unidentified cocci	1	1.3
Gaffkya tetragena	1	1.3
species	1	1.3
Candida stellatoidea	3	4.0
Candida Krusei	1	1.3
Saccharomyces	1	1.3
Cryptococcus species	1	1.3

*Specimens from 10 subjects showed no growth.

TABLE II.—GROWTH OF STREPTOCOCCI FROM VAGINA UNDER VARIOUS ATMOSPHERIC CONDITIONS

Atmospheric conditions	No. of positive cultures				
	Beta	Alpha	Non-hemolytic	Unidentified	Total
Aerobic	0	0	1	0	1
Anaerobic	1	4	7	1	13
Carbon dioxide	0	3	6	1	10
					24

After cultures were planted, the swabs were used to make a smear for Gram's stain and to make a saline suspension which was used in searching for trichomonads.

Culture methods. All cultures were planted immediately, usually within 5 minutes after obtaining the material. Cultures were set up as follows: (1) aerobic blood agar plates, *p*H 7.3, incubated at 37 degrees for 24 hours; (2) anaerobic blood agar slant, *p*H 7.3, incubated at 37 degrees for 24 to 48 hours; (3) chocolate blood agar plates, *p*H 7.3, under about 10 to 20 per cent CO_2 tension for 48 hours; (4) Sabouraud's slant at room temperature for 1 to 2 weeks.

In some instances, the aerobic and anaerobic cultures were first incubated 18 to 24 hours in B. B. L. Brewer's thioglycollate broth, and then subcultured to the blood agar plates and slants. Blood agar plates were made by adding human blood to bactonutrient agar. Chocolate agar plates were made by adding fresh sterile defibrinated blood to hot bactoproteose No. 3 agar. Anaerobiosis was achieved by placing the agar slant in a larger tube containing sodium hydroxide pellets and pyrogallic acid crystals and about 1 cubic centimeter of water. The large tube was then closed with a cork stopper and sealed with melted paraffin. The chocolate agar plates were incubated in a candle-jar to provide carbon dioxide. Colonies which grossly and on stained smear seemed to belong to the coliform group of organisms were subcultured to desoxycholate plates and to carbohydrate fermentation tubes. On anaerobic plates colonies of lactobacilli and diphtheroids were usually identified by their gross appearance and by their appearance in stained smears. Pigment formation of staphylococci was determined by subculture to milk agar. Sarcinae were identified by yellow pigment and by the typical cubical arrangement. The Gaffkya tetragena was identified by the typical arrangement in tetrads. Both aerobic and anaerobic streptococci were transferred to thioglycollate broth to check for chain formation from the broth, and blood agar poured plates were made to determine the type of hemolysis. In the single growth of beta streptococci, the Lancefield grouping was not determined. When the chocolate agar plates had colonies suggestive of neisseria, they were subjected to the oxidase test by flooding with a solution of 10 milligrams of p-amino-dimethylaniline monohydrochloride in 1 cubic centimeter of water. False positive reactions were frequently encountered, especially with gram positive rods, but were not confusing since the color faded within a few minutes.

The lactobacilli on chocolate agar were easily identified as dry colonies usually imparting a green discoloration to the medium. Microscopically they had a typical long-chained arrangement and took the Gram's stain irregularly.

Yeast-like organisms were identified and the species of candida differentiated by the commonly accepted methods (7,18) of identifying hyphae, mycelia, buds, and chlamydospores. Subcultures were made to cornmeal-dextrose agar plates and fresh carbohydrate fermentation tubes which were then overlaid with vaseline. For final identification of Can-

TABLE III.—GRADES OF VAGINAL FLORA OBTAINED FROM CULTURES

Grade	No. of cases	Incidence Per cent
O	10	13.33
I	37	49.33
II	25	33.33
III	3	4.0
Total	75	99.99

dida albicans a 2 per cent suspension in saline was injected into the marginal ear vein of a rabbit.

RESULTS

1. Organisms demonstrated, their incidence and cultural characteristics. The organisms cultured and their incidence are shown in Table I. Of the 24 growths of streptococci, 14 were nonhemolytic, 7 alpha, 1 beta, and 2 unidentified. The streptococci were interesting in their frequent failure to grow aerobically. In the 1 instance in which growth of streptococci was obtained under aerobic conditions, similar (nonhemolytic) colonies were obtained on the anaerobic blood agar slant and on the chocolate agar plate in the carbon dioxide jar. The single growth of beta hemolytic streptococci was on an anaerobic plate. The distribution of growth under aerobic and anaerobic conditions and in the carbon dioxide jar is shown in Table II. In 13 of the 14 individuals with positive cultures for streptococci, there was an associated growth of lactobacilli.

In this study, no detailed investigation of staphylococci or of diphtheroids was done.

Of the 13 individuals from whom no lactobacilli were grown, 10 had completely sterile cultures. It was impossible to identify any technical errors to explain this.

In 60 (96.8%) of the 62 cultures positive for lactobacilli, growth was obtained on the carbon dioxide plate. In the other 2 instances, growth occurred on aerobic blood agar plates only. Ten of the 60 positive cultures on carbon dioxide plates were accompanied by growth of lactobacilli on the aerobic or anaerobic culture media, or on both (Table IV).

Seventy-one (94.7%) of the direct smears contained large bacilli suggestive of lactobacilli. In 5 instances, however, these rods were gram negative, and the presumptive evidence of lactobacilli in direct smears may thus be reduced to 88.0 per cent. In all 13 of the cases with negative cultures for lactobacilli, the direct smear showed bacilli consistent with this organism, and by combining information from both cultures and direct smears, there is evidence of lactobacilli in 75 members of the series (100%).

TABLE IV.—DISTRIBUTION OF POSITIVE CULTURES OF LACTOBACILLI ON VARIOUS MEDIA

Media	No. positive cultures of lactobacilli	Per cent of positive cultures
Carbon dioxide plates only	50	80.7
Aerobic plates only	2	3.2
Anaerobic plates only	0	0
Aerobic and anaerobic plates	0	0
Aerobic and carbon dioxide plates	2	3.2
Anaerobic and carbon dioxide plates	6	9.7
Aerobic, anaerobic, and carbon dioxide plates	2	3.2
Total	62	100.0

Study of the direct smears for organisms other than lactobacilli was of little value. Cocci and small rods could seldom be identified with assurance. In no instance were cocci in chains noted. The saline suspensions showed motile trichomonads in 2 instances.

2. Relation of organisms to each other. In 37 instances (49.3%) lactobacilli only were cultivated. Three cultures yielded other organisms but no lactobacilli and would compose the group usually described as grade III. The conventional grading does not provide for the 10 instances in which no growth was obtained. We have designated this group as grade O in Table III which shows the incidence of the various grades from cultural evidence alone. If presumptive evidence from the smears is combined with the above information, grade O would be eliminated and the 10 cases would be added to grade I, while grade III would be reduced to 1 case.

3. Relation of pH to flora. In all members of the grade I group, the *p*H was 4.5. The 5 individuals from whom fungi were grown also had *p*H 4.5. Otherwise grades or specific organisms cannot be correlated with degree of vaginal acidity. Of the 12 individuals with positive cultures for streptococci in which the *p*H is known, the readings are distributed as follows: 4.5, 6 cases; 5.5, 3 cases; 5.0, 6.5,

TABLE V.—TECHNIQUE AND RESULTS OF SMEARS AND CULTURES FOR DOEDERLEIN'S BACILLUS

Investigator	No. of investigations	Vulva cleansed	Delay in plating	Media used	Atmosphere for culture	Positive cultures Per cent	Positive stained smears Per cent
Lash and Kaplan	98	1:100 $HgCl_2$	None	Dextrose broth. Subcultures to blood agar, Endo's medium and dextrose agar plates	All aerobic. Also 48 anaerobic	13	42
Thomas	107	Green soap. Sterile H_2O 1:200 $HgCl_2$	None	Whey agar plates	Aerobic and Anaerobic	7.5	18.7
Cruickshank			2–3 hrs.	1% lactose or glucose hormone agar plus 5% defibrinated rabbit blood	Aerobic		
Weinstein	375	No	1 hr. or less	Tomato peptone, peptonized milk, yeast agar	Under CO_2	22 (nonpregnant series) (60 in pregnant series)	Not reported
Lock et al.	75	No	5 min. or less	Chocolate agar	Under CO_2	82.6	88 (corrected) (94.7% including gram neg. rods resembling lactobacilli.)

and 7.5, 1 case each. Nine individuals had readings of more than 4.5 distributed as follows: *p*H 5.0 in 4 cases, 5.5 in 3 cases, 6.5 in 1 case, and 7.5 in 1 case.

Seven of these had grade II flora, including the ones with *p*H 6.5 and *p*H 7.5. Two with grade III flora had *p*H readings of 5.0 and 5.5, and 1 individual with grade III flora had a vaginal *p*H of 4.5. No correlation could be made between *p*H, vaginal flora and the number of days since the last menstrual period or until the next expected menstrual period.

4. Relation of personal cleanliness to vaginal cleanliness. No satisfactory method of evaluating personal cleanliness could be devised. From a record of the hours since the last bath, no correlation could be made with the vaginal flora.

5. Influence of flora on vaginal secretions. Although all individuals originally denied any gynecological complaint, 27 answered in the affirmative when asked directly if they were aware of any vaginal discharge. From the intermittent character and time of occurrence 6 were definitely and 7 possibly traced to the premenstrual phase of the menstrual cycle. The remaining 14 had a continuous slight discharge. Four of the 27 had negative cultures, 12 had grade I, 9 had grade II, and 2 had grade III flora. Of the 5 individuals harboring fungi, 3 had no discharge. This included the individual who harbored both cryptococcus species and Candida Krusei. Two, both with positive cultures for Candida stellatoidea, had a slight discharge described as thin, white, nonirritating and odorless. In the 2 individuals harboring trichomonads, no vaginal discharge had been noted.

DISCUSSION

Our method of growing lactobacilli in an atmosphere of 10 to 20 per cent carbon dioxide is not new, but its effectiveness has not been emphasized in previous writings (8,10, 13,22,25,26). Further work seems indicated to determine whether it is the chocolate agar, the carbon dioxide atmosphere, the associated reduced oxygen tension, the choice of subjects, method of taking cultures, or the technique in plating the material that accounts for our relatively high incidence of positive cultures (Table V). A discrepancy between stained smears and cultures of vaginal lactobacilli is not unusual, as shown in Table V.

Our introduction of the term grade O flora is possibly superfluous since stained smears furnished evidence that the negative cultures represented a failure to cultivate organisms which were present. This grouping, however, places such organisms into a separate category with different cultural characteristics from those which were cultivated. Thus 13.3 per cent of our present series of individuals harbored only organisms which did not survive the usual methods of culture. This fact assumes importance when compared with an incidence

in our laboratory of only 3 per cent negative vaginal cultures from patients with various gynecological complaints. Further attempts at isolation and identification of the organisms of grade O flora seem indicated.

Our failure to correlate the higher *p*H range with grade III flora is in agreement with the work of Weinstein (23). It is also interesting to note that a combined lactobacillus-streptococcus flora is associated with both high and low *p*H. This is contrary to the classical conception that these organisms each grow in a *p*H range which the other cannot tolerate. Our finding lactobacilli in the vaginas of *p*H of about 7.0 supports Weinstein's (23) contention that there is no direct correlation between the presence of lactobacilli in the vagina and its degree of acidity.

It is interesting to note that the streptococci were almost all microaerophilic or anaerobic. This fact raises a question as to how often such organisms may be lost if cultures are not planned to take into account adaptation to special environment in the various body cavities.

Although Candida stellatoidea and Candida Krusei are believed to be causes of vulvovaginitis (5,12), the 4 individuals who harbored these yeasts in the present study had no pruritus and only 2 had a slight discharge. A growth of Cryptococcus species is usually considered to be due to air contamination (6) but in this instance may represent a true vaginal saprophyte since several colonies developed both on Sabouraud's media and on blood agar.

Several features of this study are open to criticism. The series is short. The individuals were not followed with repeated cultures. The method of determining the *p*H was crude. The extent to which Staphylococcus albus and the streptococci were respiratory contaminants is uncertain. No attempt was made to demonstrate the organisms requiring special methods. It might be argued that spirochetes, tubercle bacilli, pleuropneumonia-like organisms (3,14), or other rare inhabitants of the vagina were missed.

All techniques for obtaining vaginal cultures are unsatisfactory, and it is doubtful if a real vaginal culture has ever been obtained. Harris and Brown (9) devised a method which in their hands was satisfactory. They used a tube within a tube, the outer one wearing a rubber cuff which was protected by protrusion of the inner tube. However, Adair and associates have shown that the Harris-Brown technique as well as several other methods failed to prevent contamination from organisms of the perineal region. Our method seemingly obviated this objection since the device used did not touch the introitus or even the vagina for a distance of about 1½ centimeters. Thus, ascent of any organisms would be from the lower vagina and not from the vulva. Our method is easily applied to nulliparous individuals but might be unsatisfactory in the presence of large cystoceles or rectoceles.

If vulvar contamination occurred in our present study, it would chiefly affect the statistics in regard to the occurrence of staphylococci. In regard to possible contamination from the perineum, it is interesting to note that no culture was positive for Streptococcus fecalis and that coliform organisms were recovered in only one instance.

SUMMARY

A survey was made of the vaginal flora in 75 normal unmarried young women.

Culture media and methods were those used in the ordinary bacteriology laboratory for routine cultures plus chocolate agar-carbon dioxide for lactobacilli.

Lactobacilli were cultured from 82.6 per cent of the subjects. This was a higher yield than any that has been recorded by previous workers.

Stained smears furnished presumptive evidence that lactobacilli were present in 100 per cent of the subjects.

The flora was classified according to the classical grades: 49.3 per cent fall into grade I, 33.3 per cent into grade II, and 4.0 per cent into grade III. In 13.3 per cent of the subjects the cultures were sterile (grade O).

Grade II and grade III flora cannot be correlated with the vaginal *p*H. In all instances grade I flora was associated with vaginal *p*H 4.5.

Besides lactobacilli, other organisms obtained on culture were: diphtheroids, Staph-

ylococcus albus, streptococci, coliform organisms, and yeast-like fungi.

All the streptococci grew under carbon dioxide or anaerobically.

Ninety-six and eight-tenths per cent of the lactobacilli grew on chocolate agar in carbon dioxide jars.

CONCLUSIONS

1. Healthy unmarried young adult females usually harbor lactobacilli within the vagina; about one-half also harbor other organisms, chiefly diphtheroids, Staphylococcus albus, and streptococci.

2. Lactobacilli can exist in vaginas ranging in *p*H from 4.5 to 7.5.

3. Cultivation of vaginal lactobacilli on chocolate agar in a carbon dioxide jar gives the most satisfactory yield reported to date, but cannot be considered an ideal method.

4. Vaginal streptococci are adapted to a low oxygen environment.

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INFLAMMATORY CARCINOMA OF THE BREAST

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THAT certain malignant lesions of the breast may simulate inflammatory lesions clinically has long been a matter of common knowledge to clinicians and pathologists. Although clinically these lesions do not present the usual picture of carcinoma of the breast and often have been mistaken for inflammatory lesions, pathologically they represent a very virulent type of cancer. They have been described by various writers under a great many different names. To denote its resemblance to inflammation the condition has been called mastitis carcinomatosa (27,38), carcinomatous mastitis (10), carcinoma mastoides (35), erysipeloid carcinoma (4, 6, 16, 20, 26, 29, 30, 32, 33), mammary carcinoma with cutaneous carcinosis of erysipelatodes type (8), and inflammatory carcinoma (13, 15, 22, 36, 41). It has also been called brawny breasts (1), acute cancer (3, 15, 19, 21, 23, 25, 31), telangiectatic carcinoma (9, 37, 40), and subepidermoidal carcinoma of the breast (11, 12).

The purpose of this study was to describe and classify this type of disease, to investigate its pathologic characteristics and to correlate its clinical manifestations with its pathologic characteristics.

MATERIALS AND METHODS

Approximately 7,000 consecutive cases of malignant lesions of the breast encountered at the Mayo Clinic from 1933 through 1945 were reviewed. All cases in which inflammatory signs such as redness and edema were manifested or in which inflammatory disease had been diagnosed before the malignancy of the lesion was recognized were selected for further study. It became apparent that redness and edema were frequently present in cases of malignant lesion of the breast in which the breast was enlarged and in which the lesion was diffuse rather than localized. These cases were, therefore, added to the study.

After discarding those cases in which the redness and edema were localized and obviously due to early necrosis and infection from invasion of the skin, 74 cases which seemed characteristic were finally selected. In 61 of these radical mastectomy had been performed, in 2, simple mastectomy and in 2, biopsy. Tissues obtained in these 65 cases were studied in detail including multiple blocks cut from all parts of the breasts which had been removed. Paraffin sections were made and stained with hematoxylin and eosin.

For purposes of orientation and control 50 additional cases of noninflammatory carcinoma of the breast were subjected to a similar examination.

CLINICAL FINDINGS IN 74 CASES

Incidence. Of approximately 7,000 cases of malignant lesion of the breast 74 were judged to be characteristic of the so-called inflammatory carcinoma type. This is an incidence of about 1 per cent.

Age and sex. The youngest patient in the series was 32 years old and the oldest was 72. The average age was 52.6 years. All of the patients were women.

Side affected. It was interesting that the left breast was involved almost twice as frequently as the right. In the total of 74 cases the lesion affected the left breast primarily in 46, the right in 28.

Bilaterality. At the time of initial examination at the clinic 2 patients already had bilateral inflammatory carcinoma and another had scirrhous carcinoma of different grade in the breast opposite the one which contained the inflammatory carcinoma. In 6 cases carcinoma subsequently developed in the remain-

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Fig. 1. Symmetrical enlargement of the breast in the presence of inflammatory carcinoma. The first diagnosis, which had been made by a physician elsewhere, had been fungus infection.

Fig. 2. Diffuse enlargement and discoloration of the breast in a case of inflammatory carcinoma. This patient had been told by her physician that she had mastitis and she had been treated with estrogen.

ing breast and 1 patient had undergone radical mastectomy for Paget's disease 2 years previous to her examination at the clinic.

Altogether 10 patients or 13.5 per cent of the group eventually had bilateral carcinoma of the breast. The time interval between the appearance of disease in the first and second breasts varied from 4 months to 7 years with an average of 2 years. In no instance did the carcinoma appear to occur simultaneously in both breasts.

Pregnancy and lactation. Twenty-four of the 74 patients had never been pregnant. One had been pregnant a short time before admission and was still lactating.

Duration of symptoms. The average duration of time before these patients came to the clinic after first noticing something wrong with their breasts was 7 months. The longest period of time was 5 years and the shortest, 8 days.

Signs and symptoms. As implied by the descriptive names previously given to this condition, its clinical signs are largely those of inflammation. So much did the condition in some of these breasts resemble an inflammatory process that it was erroneously and perhaps tragically treated as such. It is not surprising that in 14 (18.9 per cent) of the 74 cases, the condition was diagnosed inflammatory disease before its true carcinomatous nature was discovered.

The cardinal symptom of carcinoma of the breast is a lump, but in these cases a lump was noticed by only 62 per cent of the patients. Physical examination commonly revealed diffuse induration extending through much or all of the breast. In 45 per cent of the cases the tumor could not be palpated when the patient was examined at the clinic, and in the others it was poorly demarcated.

Most carcinomas do not cause an increase in the size of the breast. Inflammatory carcinoma, on the contrary, frequently enlarges the breast. Enlargement of one breast was the patient's first inkling of trouble in 6 cases (8.1 per cent). On examination at the clinic the affected breast was described as being enlarged grossly in 38 cases, a little more than half the total number. The enlargement consisted not of a tumorous protrusion but rather of a symmetrical increase in the size of the whole breast (Figs. 1 and 2).

The skin of the breasts was red or edematous or both, as if there was infection beneath. The redness varied from a rosy hue over the center or lower part to an angry red or violaceous color of the whole breast, sometimes even extending over the thoracic wall and to the axilla. Likewise the edema varied from slight puffiness of the skin to sodden thickening which pitted on pressure. Both the redness and edema were intensified when the patient stood for a long time and receded when she lay down. The lower dependent portion of the breast was more often and more severely affected. Seventy-three per cent of the breasts were described as being red, and 78 per cent

Fig. 3. Massive diffuse involvement of entire breast. Note thickening of skin.

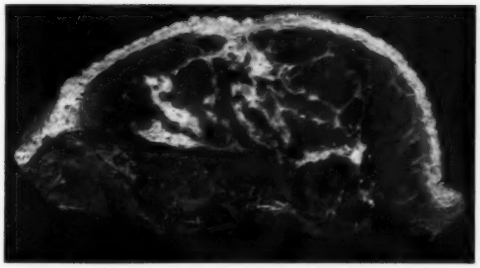

Fig. 4. Diffuse growth in strands throughout the breast. The carcinoma can be seen grossly extending along the suspensory ligaments of Cooper. The thickening and edema of the skin are apparent.

were edematous on physical examination. (Since these data were taken from records which in some cases were incomplete it is felt that the incidence of redness and edema was probably higher, perhaps nearly 100 per cent.)

It is true that redness and edema occur over a carcinoma which is infiltrating the skin and causing necrosis and ulceration. These, however, result from true inflammation and are not to be confused with redness and edema caused by inflammatory carcinoma.

Pain was a frequent symptom. Fifty-three per cent of the patients had pain at some time during the course of their disease, and in 26 per cent of the cases pain was the first symptom noticed.

Clinical examination revealed attachment of the skin to the underlying malignant tissue in 44 cases (59.4 per cent).

The nipple was noted as being retracted in 54 per cent of the cases.

Despite extensive involvement of the breasts in many cases, there were only 2 instances of ulceration of the skin. It occurred very late in a case of bilateral massive involvement, which was treated only with roentgen rays. In the other case an ulcer of a deeply retracted nipple was present.

PATHOLOGIC FINDINGS IN 65 CASES

Gross examination. The affected breasts were all large, and the discoloration and edema observed clinically were apparent in the specimens.

Skin.—On cut section the skin was found to be remarkably thickened and edematous, measuring from 2 up to 8 millimeters in thickness and averaging about 4 millimeters.

In none of the specimens was the skin destroyed by the growth. Even in those breasts in which the tumor seemed to occupy the entire substance of the breast the skin remained intact over it. In the 2 aforementioned exceptions pathologic examination could not be carried out in the case in which only irradiation was given and in the other the ulcer involved only the nipple.

Tumor.—In general the outstanding characteristics of the growth were its diffuseness and its extensiveness. In 28 cases (43 per cent) the growth was so widespread that there was no evidence of localization whatsoever (Figs. 3 and 4). Instead there were strands of diffusely growing carcinoma throughout the breast. Sometimes the clusters of malignant cells did not seem to be connected with one another, and in 3 such instances the clusters were so widely separated the growth was classified as multicentric. In 16 specimens or 24.6 per cent there was a diffuse growth in the breasts, but a localized tumor could also be recognized. In 19 cases or 29.2 per cent a localized tumor without diffuse extension was present.

When there was a localized tumor, in most instances it was very large. The size varied, however, from 2 by 1.5 by 1.5 centimeters to 12 by 11 by 7 centimeters. The average size was 6 by 5 by 5 centimeters.

Among the growths which were well enough localized to allow specification of their positions in the breasts, 17 occupied the center of the breast; 8 were so large as to occupy practi-

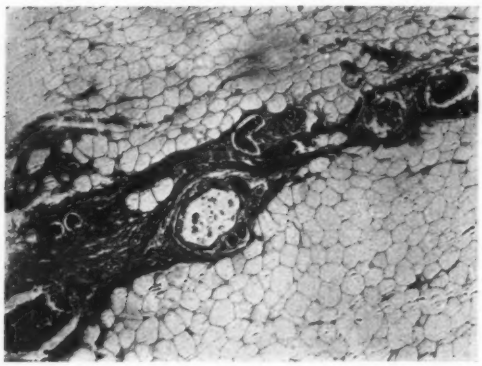

Fig. 5. Carcinoma spreading through the lymphatics in a suspensory ligament of Cooper (hematoxylin and eosin ×35).

cally the entire breast; 6 were in the upper outer quadrant; and there was 1 each in the lower inner quadrant, upper half, lower half, and outer half.

Lymph nodes.—The axillary lymph nodes were enlarged and firm in all cases, but they did not differ in appearance from those of the usual case of carcinoma of the breast with gross metastasis to the axillary lymph nodes.

Microscopic examination. The massive involvement noted grossly was confirmed on microscopic examination. The carcinoma was widespread and was found to be growing in all directions from the main masses of tumor tissue. Especially prominent were the ligaments of Cooper (Fig. 5) in which the cancer apparently was spreading by way of the lymphatic vessels.

Lymphatics.—In the course of microscopic examination as the ligaments of Cooper were followed to the skin the subepidermal lymphatics were encountered spreading peripherally. In 80 per cent of the cases these lymphatics contained carcinoma cells, and this was a characteristic feature of the disease. These lymphatics lay at the level of the sweat and sebaceous glands and ran parallel to the surface of the skin (Fig. 6a and b). In some breasts every subepidermal lymphatic seemed plugged with cancer cells (Fig. 6c), while in others many sections had to be cut before involved lymphatics could be found. In 13 breasts or 20 per cent, carcinoma cells were not found in the subepidermal lymphatics, but in 4 of these and in the specimens removed for biopsy in the 2 cases in which the lesion was inoperable, carcinoma was found in the deeper lymphatics. Carcinoma cells were found in the lymphatics in 86 per cent of the cases in which surgical exploration was carried out.

TABLE I.—POSTOPERATIVE SURVIVAL OF PATIENTS WHO HAD INFLAMMATORY ADENOCARCINOMA OF THE BREAST

	Years				
	1	2	3	5	9
Patients followed up	50	49	49	47	47
Patients known to have died	16	32	42	44	46
Patients known to have been alive	34	17	7	3	1
Per cent known to have been alive	68	35	14	6	2

Blood vessels.—The subepidermal capillaries, which run in the same plane as the lymphatics, were generally distended and engorged with blood. Cancer cells were found there in only 2 cases, but blood vessels containing carcinoma cells were found deeper in the breast in 13 instances making a total of 15 cases or 23 per cent in which intravascular spread occurred (Fig. 7a).

Skin.—The edema of the skin, visible grossly, was found on microscopic examination to be mostly in the dermis, through which ran the subepidermal lymphatic and blood vessels (Fig. 6b and c). The carcinoma cells were found in the lymphatics and blood vessels of the skin but did not infiltrate the skin directly. There were no cancer cells in the epidermis, nor was there necrosis or abscess formation.

Inflammation.—Lymphocytes and plasma cells were present in abundance at the margins of the carcinoma, but no more so than at the margins of the usual carcinoma of the breast. In the ligaments of Cooper and at the level of the subepidermal vessels there was an increased number of perivascular lymphocytes and plasma cells (Fig. 7b). In 28 cases (43 per cent) the increase was more marked than is usual in cases of carcinoma of the breast. It was impossible to correlate either the gross or microscopic extent of the disease with the number of lymphocytes and plasma

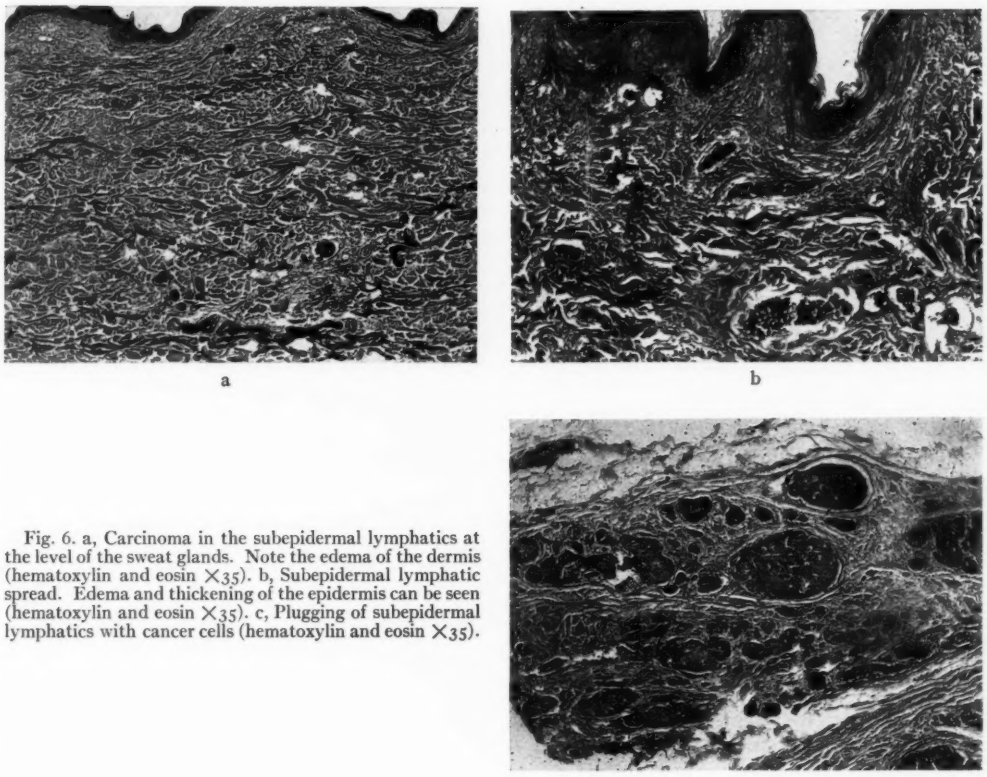

Fig. 6. a, Carcinoma in the subepidermal lymphatics at the level of the sweat glands. Note the edema of the dermis (hematoxylin and eosin ×35). b, Subepidermal lymphatic spread. Edema and thickening of the epidermis can be seen (hematoxylin and eosin ×35). c, Plugging of subepidermal lymphatics with cancer cells (hematoxylin and eosin ×35).

cells. Breasts in which every subepidermal lymphatic seemed plugged with carcinoma did not necessarily display greater perivascular reaction than those breasts in which the presence of carcinoma cells was comparatively infrequent. Nor was the amount of redness and edema related to the number of lymphocytes and plasma cells present.

In no instance was there evidence of acute inflammation or suppuration.

Grade of malignancy.—In all cases the carcinoma was highly anaplastic. Graded on the basis of 1 to 4 by Broders' method in which in grade 1 the cells are most differentiated and in grade 4, least differentiated, 88 per cent of the lesions were graded 4, and 12 per cent were graded 3. All were adenocarcinomas and 5 were mucus producing. Axillary nodal metastasis was present in 100 per cent.

Characteristics of growth.—Nothing distinctive could be found in the individual cells nor in the architecture of the growth. It was, however, in the manner of its spread that this carcinoma manifested its individuality. Rather than growing as a directly infiltrating mass, it disseminated itself through lymphatics and blood vessels.

TREATMENT AND PROGNOSIS

Sixty-three of the 74 patients underwent mastectomy. In 61 cases radical mastectomy was performed and in 2 simple palliative mastectomy. All but 1 of the patients were given postoperative irradiation. In 10 of the 11 cases in which the condition was inoperable because of obvious spread beyond the limits of surgical excision, roentgen therapy was given.

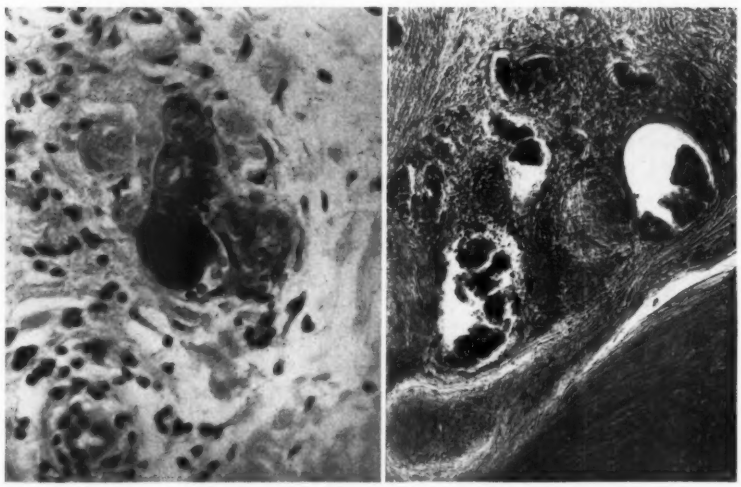

Fig. 7. a, Capillary spread of the carcinoma (hematoxylin and eosin ×350). b, Marked lymphocytic reaction around carcinoma cells in lymphatics (hematoxylin and eosin ×80).

It was possible to follow up 7 of the patients who had inoperable lesions. None of them lived more than 3 years. Of the group that received surgical treatment some were treated too recently for appraisal and it was not possible to follow up a few of the others. Some were known to have survived several years, and then further information concerning them could not be obtained. Information concerning survival is given in Table I.

There was no appreciable difference in prognosis in those cases in which the lesion was graded 3 and in those in which it was grade 4—an observation emphasizing the widespread nature of the disease.

Recognizable metastasis, aside from that to the axillary and supraclavicular nodes, was known to have developed in 42 of the 74 cases studied. By far the most frequent site of metastasis was the skin (54 per cent of 41 cases). In 20 of the 23 cases in which the lesion metastasized to the skin, it metastasized to the skin of the thoracic wall, and in one each to the arm and axilla on the same side and to the abdominal wall on the side opposite the lesion. In 2 instances there were recurrences in the scar left after previous mastectomy. Other common sites of metastasis were bone (38 per cent), thorax, including lung, pleura, and mediastinum (33 per cent), and the opposite breast (21 per cent) (Fig. 8). The total of the percentages equals more than 100 per cent since in several cases there was more than one site of metastasis.

COMMENT

The age incidence for inflammatory carcinoma in our series seemed to be about that for carcinoma of the breast in general. The average age of the patients was 56.2 years, which is similar to the average age (51.3 years) which Harrington (17) found in a study of 6,195 consecutive cases of carcinoma of the breast at the Mayo Clinic. Although all patients in this series were females Schreiner and Volavsek and Rotter described occurrence of inflammatory carcinoma of the breast in the male.

Some writers, including Boyd, Schumann, Volkman, Da Costa, Gronwald, and Ibarbia and Bessone, have suggested that the occurrence of this type of carcinoma is related to pregnancy and especially to the postpartum period. Others (Lee and Tannenbaum, Taylor and Meltzer, and Dawson and Shaw) did not believe that inflammatory carcinoma was particularly prone to occur during this period. Learmonth emphasized the mistake in con-

fusing the rapidly growing carcinomas in younger women with true inflammatory carcinoma. Among the 74 cases studied pregnancy and lactation did not appear to have any relationship to the development of inflammatory carcinoma.

The high incidence of bilateral involvement in cases of inflammatory carcinoma has been noted by Dawson and Shaw, Ibarbia and Bessone, Bloodgood, Taylor and Meltzer, Weber (39), Rasch, and Brackertz. In 13 per cent of our series bilateral carcinoma of the breast developed. This is appreciably more than the 6 to 8 per cent Harrington (18) found in a review of 6,261 cases of all types of carcinoma of the breast.

Among those who have studied the pathology of inflammatory carcinoma, there has been much controversy as to whether this type of malignant lesion spreads through the lymphatics or blood vessels. Leitch, Fischer, Camiel and Bolker, Orbach, and Schreiner and Volavsek believed that it spread through the lymphatics while Küttner, Freeman and Lynch, Nanta and Salvador, Rasch, and Van Vonno found it spreading in the blood vessels. Still others (Lee and Tannenbaum, Ibarbia and Bessone, Weber (39), Dawson and Davie, Dawson and Shaw, Pfahler and Case, and Nix) found the cancer invading both lymphatic and blood vessels. Extensive examination of multiple sections cut from the breasts removed in our cases demonstrated spread through both blood and lymphatic vessels, although predominantly through the latter. It is the peculiar propensity of this type of malignant lesion to spread toward the skin and through the subepidermal lymphatics and this propensity gives it some of its unusual clinical attributes. The presence of carcinoma in the lymphatics of the skin, many of which are blocked, prevents drainage of lymph and causes edema of the skin. Generalized lymphatic involvement throughout the breast produces stasis of lymph and later enlargement of the entire breast.

It is quite likely that stasis also accounts for the redness and discoloration of the breast. Like the edema, the redness tends to disappear when the patient is lying down. Extensive cancer plus inadequate lymphatic drainage produces increased pressure within the breast and the resultant passive hyperemia. The presence of an increased amount of blood, especially in the subepidermal region, leads to redness and blueness of the skin. When the patient is in the recumbent position the effect of gravity somewhat reduces the amount of stasis and modifies the circulatory findings.

Fig. 8. Evidence of metastasis to the thoracic wall and the opposite breast.

In no instance was there either clinical or pathologic evidence of infection to account for the inflammatory signs in our series of cases. At microscopic examination lymphocytes and plasma cells were often found in the vicinity of the cancer, but no more than in comparable carcinomas without clinical signs of inflammation. Clumps of lymphocytes were also found in the subepidermal tissue as previously described by Learmonth, Ewing (according to Lee and Tannenbaum), and Leitch. The finding of these clumps may indicate that stasis of lymph or possibly a reaction to some irritant product of the carcinoma had occurred.

All observers who have studied inflammatory carcinoma have been impressed with its poor prognosis. Some writers (Lee and Tannenbaum, Geschickter, Pack and Livingston, and White) have felt that palliation is the only hope and that irradiation is the best therapy. Orbach, Leitch, Bloodgood, and Learmonth, however, reported occasional excellent results of surgical treatment. In our series surgical treatment was employed in all cases in which the lesion had not obviously spread beyond the limits of excision. The fact that 3 patients survived for 5 years after operation would seem to justify this type of therapy.

SUMMARY

In 74 (1 per cent) of approximately 7,000 cases of malignant lesion of the breast, the

diagnosis was inflammatory carcinoma because of characteristic clinical features which simulated those of inflammation. The disease was found to occur in the same general age group as carcinoma of the breast, and there was no particular correlation with pregnancy or lactation. The incidence of bilateral malignancy was two times that noted in comparable cases of the usual carcinoma of the breast. The left breast was affected primarily nearly twice as frequently as the right. On examination both breasts were large and often the involved one had become bigger than its mate. The skin over the breasts was red or edematous or both, and palpation frequently revealed diffuse infiltration rather than a localized tumor. The axillary nodes were involved in all cases.

Pathologically the lesions were diffuse, high-grade adenocarcinomas, which frequently involved the lymphatics and occasionally the blood vessels. Characteristically the cancer spread through the subepidermal lymphatics. There was no evidence of bacterial infection, and ulceration of the skin was extremely rare. The inflammatory appearance was apparently due to blockage of the lymphatics by cancer cells and the resultant vascular phenomena.

Prognosis for life is poor, but 3 patients lived more than 5 years after operation, and 1 was alive 9 years after operation.

The common sites of metastasis were the thorax, bone, the opposite breast, and the skin. Occurrence of metastasis to the skin was especially frequent, having been present in 55 per cent of the cases in which metastasis was known to have occurred.

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THE EARLY CLOSURE OF CONSTANTLY CONTAMINATED INFECTED WOUNDS WITH THE AID OF URETHANE-PENICILLIN MIXTURES

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ABSCESSED, undermined, postoperative wound infections are occasionally encountered by the surgeon in spite of improved techniques and antibacterial therapy. If the incision is near the anus, or has a colostomy in or adjacent to it, one is confronted with the problem of constant fecal contamination (Fig. 1). These wounds are complicated by prolonged hospitalization, painful dressings, loss of protein, and hernias. Frequently, the fear of evisceration causes temporization in the usually accepted principle of adequate open drainage. It is the purpose of this preliminary report to show that such wounds can be opened widely, surgically closed, and satisfactorily healed within a short period of time in spite of constant contamination.

It has been our observation that infected wounds treated with wide open drainage and subsequent healing by second intention progress much more rapidly and favorably than do those which are treated by means of conservative catheter irrigations or drainage through small openings.

The war literature has clarified and emphasized certain principles of reparative surgery as applied to battle injuries. In general, the accepted treatment for all wounds is a two stage operation consisting of débridement and closure. The optimal time for this closure begins on about the fourth and ends on approximately the tenth day. Early in this period muscle and fascial planes can be sutured, but beyond the fourth day the feasibility of anatomic layer closure diminishes and the need for through-and-through sutures, undercutting, and wound excision increases (1). Invasive infection calls for drainage, excision of devitalized tissue, chemotherapy, and moist dressings (2). The severity of the infection dictates the time of closure. Decision to close a wound should be based on its gross appearance. Experience has shown that decision to close a wound based on bacteriological study is impractical, failure having followed the closure of sterile but dirty wounds while "clean" wounds healing by first intention after delayed closure may show a profuse bacterial flora (2). Thus, closure and not sterilization is the primary objective in wound management. Lyons stated that, "Suppuration of a wound is believed to be due more to the presence of a pabulum of wound protein than to any specific bacterial virulence." The presence of devitalized tissue prevents or delays the action of antibacterial agents and calls for prompt débridement. It is obvious that surgical débridement is more rapid and effective than chemical methods.

The above outlined principles which have proved successful in the management of war injuries and in the closure of decubitus ulcers have not been widely applied to postoperative wound infections. Although it is not possible to sterilize a wound that is constantly being recontaminated by feces, it has been possible, with the use of proper surgical measures and the aid of chemotherapeutic and antibiotic agents to convert it into a clean wound and to effect an early surgical closure in the majority of instances in this small series.

Many of the infections reported here are distinguished by the fact that the abscess is discovered after the fourth day and involves the full extent of a closed surgical wound down to the peritoneal layer. A colostomy in or

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Fig. 1. Infected undermined postoperative wound with a retracted colostomy pouring feces into it.

adjacent to the wound may be a constant source of recontamination. The patient is in the older age group and has been debilitated by malignant or chronic disease and an operation. The danger of evisceration is imminent. Invasive infection is often present in spite of previous antibiotic and chemotherapy and calls for the application of moist dressings. For this purpose we have instituted the use of a 10 per cent solution of urethane containing 1,000 units of penicillin per cubic centimeter.

The limited rôle of chemotherapy in the management of wounds has been emphasized and local chemotherapy has been condemned (10). There are many reasons to explain the failure of topical therapy of infected wounds. Among these are the ineffectiveness of the agent in the presence of pus and devitalized tissue, the formation of penicillinase by certain gram negative organisms, the local trauma incident to topical therapy and the inability of available antibacterial agents to sterilize a wound. On the basis of accumulated experience in large series of cases the local use of the sulfonamides in open wounds has been abandoned (3, 11). It is questionable whether a blanket condemnation of all local chemotherapy is justifiable based on experience with the relatively few antibacterial agents that have had adequate clinical trials. Certain agents such as activated zinc peroxide, normal saline, and hypochlorite solutions are of established value under certain conditions. Few antibacterial agents have had adequate evaluation based on large series of cases comparable to the studies on penicillin and the sulfonamides conducted by the Subcommittee on Surgical Infections and Burns of the National Research Council. There are instances in which systemic antibacterial therapy is impossible or unjustified in ambulatory patients with small lesions. Some form of local therapy is indicated in these cases. Because of inadequate blood supply or scar tissue barrier, it is often impossible to secure effective concentration at the site of the lesion by use of a systemically administered drug. Encouraging reports on the use of local antibiotic and chemotherapeutic agents have recently appeared in the literature (5, 6, 12).

The proper treatment of surgical infections demands that the selection of the antibacterial agents be based on the sensitivity of the organisms present in the wound which is being treated. A number of agents are now available each with its own specific indications and contraindications. It is not necessarily a requirement that an antibacterial agent should sterilize a wound to establish its value. It is possible that some of the antibacterial agents now being studied will assume a useful though limited rôle as topical agents in the fight against infection. In cases in which moist dressings are indicated, especially in the presence of frequent fecal contamination, it would seem rational to use a solution containing antibacterial agents capable of modifying the bacterial flora and helping to hold it in check, provided one is available that is not damaging to tissues.

We first used urethane as an antibacterial agent in 1944 after Weinstein and McDonald demonstrated in vitro that this drug was a potent bactericidal agent for gram negative organisms (14). Earlier this year a study of 39 urethane treated patients was reported and the highly specific action of this drug against gram negative organisms was substantiated when it was applied topically to infected wounds in man (8). This specificity suggested that urethane might be advantageously combined with penicillin, for theoretically it should

stop the formation of penicillinase by attacking the gram negative organisms and thus enhance the action of penicillin against the gram positive organisms in the same wound. A combination of bacteriostatic quantities of urethane with penicillin has since been shown to bring about a complete suppression of the growth of mixed cultures of Staphylococcus aureus and of Escherichia coli. No inactivation of penicillin by the urethane or of urethane by the antibiotic agent could be demonstrated (13).

Chemical observations and laboratory data indicate that the occasional gastrointestinal symptoms accompanying urethane therapy are not due to organic toxic changes (7). Over 60 patients have been treated with topical urethane solution either alone or in combination with sulfanilamide or penicillin. Of the first 39 cases reported, 5 patients were treated with 10 per cent urethane solution, 2 with 20 per cent urethane solution, and 32 with a combination of 10 per cent urethane and 1 per cent sulfanilamide. We abandoned the use of sulfanilamide in the mixture because the slight synergistic effect demonstrated in vitro seemed of no significance clinically and the bacterial flora showed as good a response by using urethane alone (8). We are now using the urethane-penicillin mixture unless the culture shows a pure gram negative flora. The 17 patients whose cases are reported were treated with a solution of 10 per cent urethane containing 1,000 units of penicillin per cubic centimeter with the exception of one patient (Case 1) who was treated with 10 per cent urethane alone, and another (Case 12) who was treated with a solution of 10 per cent urethane and 1 per cent sulfanilamide. Eight of the 17 patients had an open colostomy in or adjacent to the wound.

METHOD

On discovery of the infection, wide open drainage, culture, and débridement are done in the operating room. Abdominal wounds are opened down to the peritoneal layer, and all devitalized tissue is excised. Fine steel wire sutures are placed and left untied to be secured in the event of evisceration. Two small catheters are anchored into the wound which is packed with gauze. Surrounding skin areas are covered with vaseline strips. An outer sterile dressing is covered with waxed paper. Paregoric or deodorized tincture of opium is given to check colostomy discharge if necessary. Systemic antibacterial therapy is continued as indicated. Urethane-penicillin mixture is injected into the catheters every 2 hours in amounts sufficient to keep the wound constantly wet without soaking the surrounding skin. Packs are changed promptly when gross fecal contamination occurs; mask and sterile gloves are used. Otherwise the wound is inspected on the third to the fifth day depending on our estimation as to when it will be ready. This estimate is based on its appearance at the time of débridement. In order to be ready for immediate closure the inspection should be carried out on the operating table to avoid the possible contamination entailed in a dressing on the ward. If the appearance of the wound is not satisfactory further débridement may be indicated, a fresh dressing is applied, and treatment is continued.

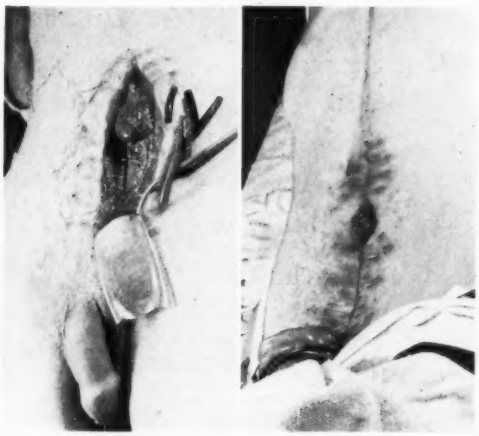

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Fig. 2. Case 1. a, Infected postoperative abdominal wound (Miles operation). Note the colostomy presenting in the wound and the intact peritoneum. Wire sutures are in place to be secured in the event of evisceration. Picture taken 6 days after drainage of abscess, débridement of slough and necrotic fascia and constant 10 per cent urethane soaks. The wound is clean and healthy. Drain communicates with the perineal wound beneath symphysis pubis. b, Wound surgically closed around the colostomy 13 days after débridement and urethane therapy and healed as by primary intention. We now believe that such wounds can be closed on the fourth to sixth day.

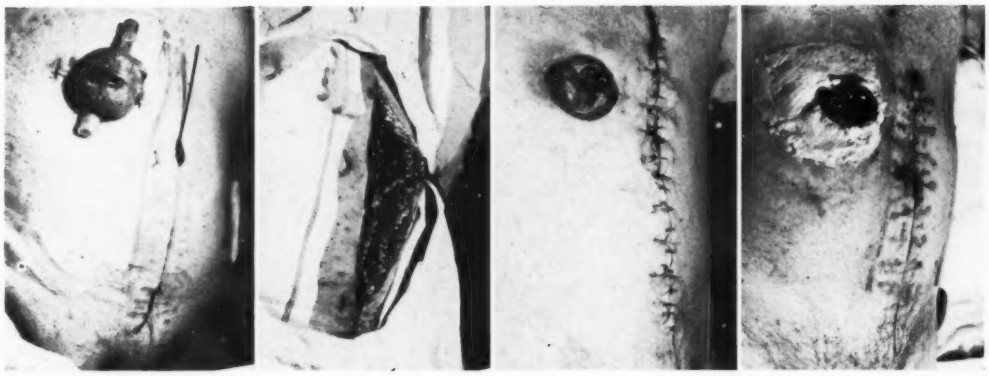

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Fig. 3. Case 2. a, Infected undermined abdominal wound with adjacent open draining colostomy. About 5 ounces of thick pus has just been evacuated. b, Wound opened widely in operating room. Débridement to be done. c, Wound clean and surgically closed after 8 days of treatment with moist dressing of 10 per cent urethane solution containing 1,000 units of penicillin per cubic centimeter. d, Primary healing.

The next inspection is carried out after 3 or more days of continued therapy depending on the condition of the wound at the time of the first inspection.

Wounds so treated remain clean, red, soft, and free from green pyocyaneous pigment. Closure is usually done under light pentothal anesthesia. If the infection has been discovered early and drainage and débridement promptly carried out, it is sometimes possible to do a layer closure after simple freshening of skin margins. Beyond 4 days following drainage and débridement, the wound is usually clean but rigid in which case it is excised. It is seldom possible to do a layer closure after excision. Fine through-and-through steel wire sutures are placed about 3/8 inch apart and alternate wires may be tied over space obliterating gauze rolls (Fig. 4c). The skin is approximated with additional silk sutures. Originally 2 No. 10 F. perforated soft rubber catheters were led out through the wound extremities to allow drainage and through which to instill urethane-penicillin mixture for 2 or 3 days. This measure has lately been abandoned. If a colostomy is present a small portion of the wound around it is left unclosed and is packed with gauze saturated with urethane-penicillin mixture.

The following brief case reports are illustrative.

Case 1 (Fig. 2). A 50 year old male had a palliative Miles operation for cancer of the rectum on December 17, 1946. Following operation he was given penicillin 50,000 units every 3 hours for 19 days. On the twelfth postoperative day a severe wound infection was detected. A large abdominal abscess connected with the perineal wound beneath the symphysis pubis which was the site of a low grade osteomyelitis. The incision was opened widely down to the peritoneal layer, débrided, packed, and treated with constant 10 per cent urethane soaks for 13 days. Culture taken at the time of débridement grew out, Escherichia coli, Bacillus mucosus, Proteus morgagnii and nonhemolytic streptococci. Adequate supportive therapy in the form of blood transfusions, intravenous fluids, amino acids, and vitamins was given. Intramuscular penicillin therapy was discontinued because of development of sensitivity (arthritis). On the seventh day of treatment when the wound was clean and pink the supply of urethane ran out and saline solution was substituted. The following day the wound was lined with a pyogenic membrane and the dressing was green with pyocyaneous pigment, but reverted to its clean pink color within 24 hours after returning to urethane treatment. The discharge from the colostomy which opened directly into the wound (Fig. 2a) was kept at a minimum by giving deodorized tincture of opium minims 10 by mouth 4 times a day. On the thirteenth day the wound was closed by excision and undercutting, and with through-and-through fine steel wire sutures. Culture at the time of closure yielded Pseudomonas pyocyanea, Aerobacter aerogenes, diphtheroids, enterococci, Clostridium welchii and pseudotetani. A drain down into the perineal space was led out just above the symphysis pubis. It was removed by the seventh day and its site soon closed over. The wound healed per primam (Fig. 2b).

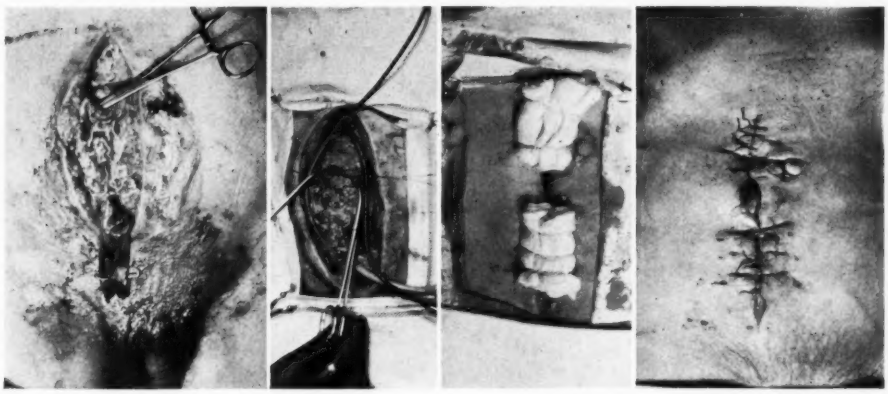

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Fig. 4. Case 6. a, Infected postoperative abdominal wound following drainage of an obstructing appendiceal abscess and ileostomy. Kelly clamp indicates ileostomy discharging into and digesting tissues. Peritoneum is intact. b, Wound opened and débrided. Catheters for instillation of urethane-penicillin mixture are in place and gauze pack will be inserted. Attempted ileostomy closure failed. c, Wound surgically closed around ileostomy after 4 days of treatment with 10 per cent urethane solution containing 1,000 units of penicillin per cubic centimeter. Alternate fine steel wires are tied over space obliterating gauge rolls. d, Blood-cotton pack (3) controlling ileostomy discharge is in place. Wound healed by primary intention.

Such patients usually require weeks of hospital care and dressings. Our present belief is that this wound could have been successfully closed on the fourth or fifth day. The development of suppuration when saline solution was substituted for urethane and its reversion to its former "clean" state after the reinstitution of urethane therapy are evidence of the beneficial action of the drug in this case.

Case 2 (Fig. 3). A 64 year old male with mild, controlled diabetes not requiring insulin had an infected abdominal wound discovered 11 days after an abdominoperineal sphincter preserving "pull through" operation for cancer of the rectum, and 4 days after an open transverse colostomy done because of retraction of the perineal segment of bowel. On April 28, 1947 the wound was opened widely down to the peritoneal layer and a meticulous débridement was done. Cultures revealed Escherichia coli and Proteus vulgaris. Two catheters were led out through the extremities of the wound which was lightly packed with gauze. A solution of 10 per cent urethane containing 1,000 units of penicillin per cubic centimeter was injected into the catheters every 2 hours in sufficient quantity to keep the packs constantly wet. Deodorized tincture of opium minims 10 three times a day was given by mouth. On the eighth day of treatment ⅛ inch of skin and subcutaneous tissue was excised from the wound margins. The fascia was approximated with interrupted chromic catgut and the wound was closed with through-and-through fine steel wire. The skin was further approximated with black silk. Culture taken at the time of closure yielded the same organisms and the wound was clean and healthy in appearance.

One catheter was led out of the upper end of the wound through which 10 cubic centimeters of urethane-penicillin mixture was instilled every 3 hours for 3 days after which the catheter was removed. The patient received parenteral vitamins B, C, and K. Before operation his blood volume studies showed a deficit of 18 cubic centimeters. He received one blood transfusion during his original operation and his hematocrit and hemoglobin remained within acceptable limits without further protein replacement therapy. Soft white healing by primary intention resulted.

In the light of subsequent experience the wound in this case could also have been closed several days earlier. Even on the eighth day it was possible to close the fascia as a distinct layer.

Case 6 (Fig. 4). A 51 year old male had drainage of an intra-abdominal abscess secondary to a ruptured appendix on July 28, 1947. Because of small bowel obstruction caused by the abscess and unrelieved by a Miller-Abbott tube, the surgeon did a double pursestring catheter ileostomy and brought the catheter out through the wound. Eight days postoperatively the wound was opened because of undermining infection and necrosis from the discharge of bowel contents through the everted ileostomy stoma which presented itself in the wound just beneath the skin, the catheter having been extruded. A culture yielded Escherichia coli, Bacillus subtilis, and diph-

a b c

Fig. 5. Case 17. a, Wound after drainage of a large abscess of the perineum and thigh before débridement. b, Surgical closure after débridement and 10 days of urethane-penicillin instillations. Lower 2 inches of wound did not heal because edges were not freshened in this area at time of closure. c, Primary healing after freshening lower aspect of wound margins (see text).

theroids. An unsuccessful attempt was made to close the ileostomy stoma. After 4 days of urethane-penicillin applications, the wound was closed about the ileostomy opening as outlined above. The ileostomy discharge was successfully controlled by the use of blood-cotton packs (4). The wound healed by primary intention allowing operation through a clean field on August 23, 1947, at which time the ileum was mobilized and the stoma closed. The patient received penicillin 500,000 units and streptomycin 400 milligrams intramuscularly every 4 hours from July 22 to July 25, 1947 and penicillin 100,000 units every 4 hours from August 23 through 29, 1947. Also he received multiple blood transfusions, protein hydrolysate and parenteral vitamins B, C, and K. After an uneventful recovery he was discharged, wound healed on September 3, 1947.

Case 17 (Fig 5). A 59 year old diabetic housewife entered the hospital on March 28, 1947 with chills, fever, dermatitis of the thighs, and a tender swollen perineum. Examination showed a large abscess centering over the perineum and extending to the anus, vagina, and left thigh. Benedict's test gave a brick red reduction. A fasting blood sugar was 250 milligrams per cent. On March 30, 1947 the wound was opened through a 12 inch incision from mid-thigh to anus and another 2 inch incision extending into the groin. A large pocket of pus remained and on April 4, 1947 further incision was necessary to secure wide open drainage. On April 13, 1947 tropical antibacterial therapy was first started. Cultures revealed the presence of a non-hemolytic streptococcus, staphylococcus, Escherichia coli, Proteus vulgaris, and enterococci, and the wound contained grayish yellow pus and necrotic fascia (Fig. 5a). Catheters and pack were inserted and a solution of 10 per cent urethane containing 1,000 units of penicillin per cubic centimeter was used as a constant moist dressing. On April 18, 1947 the wound appeared clean and healthy, most of the necrotic fascia having disappeared. On April 23, 1947 the wound was closed with silk around 3 catheters (Fig. 5b) through which 30 cubic centimeters of urethane-penicillin mixture were injected every 3 hours until April 29, 1947 when the catheters were removed. At operation, although the wound appeared clean, its margins were excised in its upper aspects. This part of the wound healed per primam. On May 2, 1947 the unhealed skin margins of the lower aspects of the wound were freshened and resutured followed by prompt healing. Following incision and drainage her diabetes came rapidly under control and she was discharged with an insulin requirement of 15 units daily, her wound having been successfully closed in two stages 19 days after wide open drainage.

One pertinent point demonstrated by this case is that even though clean, a wound of more than several days in duration will heal more promptly if its margins were excised at the time of closure. Complete marginal excision at the time of the first closure would have obviated the second stage and have saved considerable time in the hospital. More prompt drainage and antibacterial therapy might have resulted in earlier closure and a shorter convalescence.

RESULTS

Seventeen infected wounds of various types have been treated by the regimen outlined

TABLE I.—EARLY CLOSURE AFTER WIDE OPEN DRAINAGE IN MASSIVE WOUND INFECTIONS

Case No.	Diagnosis	Type of wound infected	Source of contamination	Opening to closure	Healing
1	Cancer of rectum	Abdominal (Miles operation)	Colostomy in wound	13 days*	Primary
2	Cancer of rectum	Abdominal (abdominoperineal resection)	Adjacent colostomy	8 days†	Primary
3	Carcinomatosis intra-abdominal	Abdominal	Colostomy in wound	13 days	Healing expired 5th day
4	Cancer of colon	Abdominal	Adjacent colostomy	12 days†	Primary
5	Cancer of rectum (dehiscence)	Abdominal	Adjacent colostomy	**	Primary
6	Abscess, intraperitoneal (ruptured appendix)	Abdominal	Ileostomy in wound	4 days†	Primary
7	Cancer of cecum	Abdominal (carcinoma exteriorized)	Colostomy in wound	12 days	Primary
8	Recurrent cancer of colon (intestinal obstruction)	Abdominal	Adjacent colostomy	4 days†	Failure
9	Cancer of transverse colon	Abdominal	Intra-abdominal abscess—fecal fistula	**	Unsatisfactory
10	Interstitial obstruction (small bowel)	Abdominal	At dehiscence	10 days	Primary
11	Cancer of cecum	Abdominal	At operation	3 days‡	Satisfactory
12	Cancer of cecum	Abdominal	At operation	7 days‡	Satisfactory
13	Cutaneous sinus (inguinal)	Inguinal herniorrhaphy	At operation	3 days	Primary
14	Ruptured appendix	Abdominal	At operation	11 days†	Primary
15	Breast abscesses (multiple)	Inguinal herniorraphy	At operation	**	Frimary
16	Compound fracture both bones of leg	Leg (partial closure)	At accident	7 days	Satisfactory
17	Diabetic abscess	Perineum	Anus	19 days	Primary

*Treated with 10% urethane solution
†Layer closure
**Closed at time of drainage and débridement
‡Treated with 10% urethane 1% sulfanilamide mixture

(Table I). All were surgically closed within less than 14 days after open drainage except 1, an abscess of the perineum which was opened and closed in two stages in 19 days.

There were 15 successful closures and 2 failures. Of the successful cases 11 wounds healed by primary intention with soft white healing. In Case 11 healing was satisfactory but with a small area of granulation tissue at one end of the wound. In Cases 12, 15, and 16 there was slight induration and redness around the wound for several days. For this reason they were not classified as healing by primary intention although the clinical end-results were as good as those with true primary healing.

Layer closure was done in 5 instances (Cases 2, 4, 6, 8, and 14).

Of the 13 patients with abdominal wounds, 8 had fecal discharge into the wound.

The average elapsed time from opening to closure in all wounds was 7.41 days.

A brief résumé of the 2 failures in our series follows:

CASE 9. A 54 year old single female factory worker had a Mikulicz resection of a carcinoma of the transverse colon and a resection of 25 square inches of her right lateral abdominal wall to which the carcinoma was adherent, on May 25, 1946. She made an uneventful convalescence gained weight and returned to work. On follow-up examination a small nodule was palpable within the colostomy against the lateral abdominal wall. It remained stationary in size for 5 months and it was thought to be scar tissue at the site of plastic closure of the abdominal wall defect. On September 5, 1946 the colostomy was closed at which time the nodule was biopsied and proved to be adenocarcinoma grade II. A fecal fistula developed, persisted for several months, and finally healed. A progressively enlarging mass appeared beneath the incision. In spite of this she remained vigorous and did not lose weight. On June 4, 1947 she presented herself with small bowel obstruction of several days' duration. After 10 days of Miller-Abbott tube decompression an exploratory laparotomy was done on June 14, 1947. A matted mass of intestines and carcinoma occupied the right half of the abdominal

cavity. There were multiple metastases in the liver. The bowel was still dilated, thick, and friable in spite of decompression. A tube ileostomy was done. After 3 more weeks of decompression and supportive therapy it was decided to do an ileosigmoidotomy as a palliative measure inasmuch as the patient was still in excellent condition and had not yet begun to fail. This was done on July 8, 1947 and in freeing up the sigmoid a pocket was opened releasing about 2 ounces of pus. In spite of the sepsis an anastomosis was done because it was the last chance to attempt palliation. The wound was closed around catheters through which 30 cubic centimeters of 10 per cent urethane containing 1,000 units of penicillin per cubic centimeter was injected every 3 hours for 5 days. A low grade wound infection developed which was opened and drained. The patient failed and became moribund. Urethane penicillin therapy was stopped and the patient was kept comfortable with opiates and she expired on July 31, 1947. Among other findings, the postmortem examination showed generalized intra-abdominal carcinomatosis and a fecal fistula

CASE 8. A 78 year old female had a resection of her sigmoid colon for carcinoma 1 year before entry. She complained of weight loss, anorexia, vomiting, and short bouts of diarrhea. Examination showed evidence of marked weight loss. The right lower abdominal quadrant was the site of a functioning cecostomy. Laboratory work on entry showed a total protein of 5.04 grams per 100 cubic centimeters and a hemoglobin of 10.5 grams. A diagnosis of partial small bowel obstruction was established after Miller-Abbott intubation studies. She was given daily protein hydrolysate and received a transfusion of 1 unit of whole blood on September 24, 1947. On the following day laparotomy revealed carcinomatosis of the peritoneal cavity. A palliative resection of a segment of ileum with side-to-side anastomosis was done. She received 1 unit of whole blood during the operation and on the following day her total protein was 4.23 grams per 100 cubic centimeters, blood chloride 81.8 milliequivalents and hemoglobin 11.5 grams. Daily protein hydrolysate infusions were continued. She received 500 milligrams of cevitamic acid and 1 ampule each of vitamin K and parenteral B complex daily. From September 25 to September 28, 1947 she received 0.5 gram of streptomycin and 100,000 units of penicillin every 3 hours following which the dosage of each was diminished by one-half and continued to October 13, 1947. The wound became infected and was opened widely and débrided on October 6, 1947. There was redness and induration at its lower aspect and 2.5 ounces of creamy pus was released. Culture yielded Proteus vulgaris, Escherichia coli, enterococci, streptococci, and pseudotetani. Débridement included the sites of the stay sutures which had cut into the tissues leaving pus filled crevices. Urethane-penicillin treatment was carried out as outlined above for 4 days. On October 10, 1947 the wound was dressed in the operating room and although clean, the tissues were dull, flabby, and of poor quality. Under light sodium pentothal anesthesia the wound margins were excised and the wound closed with fine steel sutures through all layers, every other suture being tied over space obliterating gauze rolls. Following closure, she was given 0.25 gram of streptomycin every 6 hours and 30,000 units of penicillin every 3 hours. Supportive therapy was continued. Her total protein and albumin levels remained low in spite of protein restorative measures. On October 14, 1947 it was apparent that the closure had failed and that the wound was septic. Culture showed the same organisms plus Pseudomonas pyocyaneus and Bacillus mucosus. The wound was widely opened. The patient was comfortable following operation and apparently none the worse for the attempted closure and at the request of her family was discharged home for terminal care.

SUMMARY AND DISCUSSION

Adequate dependent drainage of an abscess is a well accepted surgical principle. Its application to postoperative wound infections is by no means universal. There is a reluctance among surgeons to treat a long meticulously closed wound by opening it widely. One sees massive wound infections treated by small openings, inadequate drainage and catheter irrigations often resulting in prolonged convalescence, tissue destruction, and eventual hernia. The application of the principle of adequate drainage to postoperative wound infections needs re-emphasis. Adequacy of drainage implies the complete unroofing of all recesses and pockets and usually means reopening the full length of the wound. The fear of evisceration is probably the main deterring factor. In this report there are 2 dehiscences (Cases 5 and 10, Table I). At the time of dehiscence, these wounds were clean and infection developed secondarily. In no case was dehiscence encountered as a result of infection. It is our belief that dehiscence is a distinct entity which is rarely completely dependent upon infection. Small openings and inadequate drainage are not prophylactic against evisceration but on the contrary are conducive to it. It is known that the skin and subcutaneous tissues have little to do with the tensile strength of a wound (9). To leave a bridge of skin and fat over an undermined infection serves only to imprison the pabulum that will enhance invasive infection and destroy fascia. The peritoneal suture line was intact in all of our cases of abdominal

wound infection and remained firm throughout the course of treatment.

Once having accepted and practiced the principle of wide open drainage for postoperative infections one is confronted with the problem of treatment and closure of an open wound. The necessity for a protective dressing in the face of fecal contamination is obvious and the presence of devitalized tissue or invasive infection calls for the use of moist dressings. The utilization of a solution which contains antibacterial agents seems rational provided these agents are not detrimental to wound healing and are capable of inhibiting the bacterial flora and improving the gross appearance of the wound. If these principles prove successful in the management of wounds bathed in feces they should be even more efficacious in wounds not so complicated. Such has been our experience in the few preliminary cases reported here. The advantage of urethane-penicillin mixture over saline was exemplified in Case 1 in which it seemed obvious that the mixture was helping to hold Pseudomonas pyocyaneus in check. Once a postoperative wound infection has been converted to a "clean" wound it can be treated as any open wound and surgically closed.

The true age of most of these wounds dates from the time of the original operation and not from the time of drainage and débridement. Thus they are not strictly comparable to the war wounds on which the concept of an optimal closure period extending from the fourth to the tenth day is based. From 5 to 7 days has usually elapsed before the infection is discovered and this fact probably explains why layer closure cannot be more often accomplished.

The early closure of infected wounds uncomplicated by a source of recontamination has been accomplished without difficulty. At first we were hesitant about closing wounds with feces draining into them but now believe that many of them can be closed on the fourth to sixth day if properly treated. Meticulous attention to detail and faithful nursing care are essential. Although the use of urethane-penicillin mixtures has seemed to be a useful aid in the conversion and closure of these wounds, it is not to be thought of as the predominant factor, for the application of sound surgical principles, the correction of anemia and the restoration of tissue proteins are of paramount importance. It is difficult to assess the value of continued systemic antibiotic and chemotherapy when the infection being treated develops despite their prophylactic use.

Case 9, classed as a failure, is included even though the problem was not that of treatment of an established wound infection. An attempt was made to use urethane-penicillin mixture as a prophylactic in a contaminated wound. The wound had partly healed when the fecal fistula developed and contaminated it from within, a situation with which no antibacterial measures can be expected to cope. The other failure was in a debilitated, depleted 78 year old lady with peritoneal carcinomatosis in whom the usual protein restorative measures were ineffective. It was probably an error in judgment to attempt closure of her wound. This is a true failure attributable to irreversible fault in the processes which influence wound healing.

CONCLUSIONS

A method for the treatment of postoperative wound infections is outlined and the need for the use of wide open drainage and careful débridement is emphasized.

A combination of early wide open drainage, proper application of the principles of "reparative" surgery, and topical antibacterial therapy allows conversion of postoperative wound infections with a constant source of fecal contamination into "clean" wounds which may be surgically closed within a short period of time, thus averting many of the complications of wound infections.

Layer suturing may be accomplished early in the optimal period for wound closure.

Urethane-penicillin mixture by virtue of its action upon both gram negative and gram positive bacteria appears to be a useful adjunct to reparative surgery.

Seventeen patients with postoperative infected wounds 8 of whom had a colostomy in or adjacent to the wound have been treated and the wounds surgically closed within an average of 7.41 days after open drainage. There were 2 failures. Primary healing occurred in 11 cases.

The length of hospital stay attributable to wound infection appears to have been materially shortened.

NOTE.—Since this paper was submitted for publication 9 additional cases of infected wounds have been treated and surgically closed making a total of 26 wound closures, with no additional failures. The average elapsed time is 6.69 days from opening to closure.

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A LARGE PULSION ESOPHAGEAL DIVERTICULUM WITH COMPLICATIONS

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THE report of a single case of large esophageal diverticulum of the pulsion type, particularly from a clinic where 270 patients with such diverticula have come to operation, could well seem peculiar were it not for the fact that the complications in this case were of such variety and nature that an opportunity presented itself to demonstrate and discuss their management.

REPORT OF A CASE

A man, aged 67 years, complained of difficulty in swallowing which had been present for 40 years. When he was about 26 years of age this difficulty in swallowing began and has gradually become worse until recently he has been able to swallow very little solid food. As he ate, a swelling would appear in the anterior left portion of his neck as a result of the accumulation of food within the large diverticular sac. This food caused the patient discomfort and by his exerting external pressure over the mass the food was regurgitated. Patient originally weighed 160 pounds; at the time of admission he weighed 127 pounds, having lost 20 pounds during the last 2 or 3 years (Figs. 1 and 2).

The patient was seen by the members of the medical department of the clinic who ascertained that 6 weeks before his admission a right sided pneumonia had developed, which was treated successfully with penicillin. He has had a chronic mild cough since that time but other than arteriosclerosis, cardiac hypertrophy, and auricular fibrillation, nothing abnormal was noted in his physical findings. Operation for removal of the diverticulum was advised.

MECHANISM OF OBSTRUCTION

In previous papers and discussions on this subject[1] attention has been called to the fact that obstructive symptoms in patients with pulsion esophageal diverticula occur only when the sacs have become large enough to pull upon the opening into the esophagus beyond the neck of the sac. Thus, the esophagus, instead of being in the transverse position so that food passes directly into it on swallowing, is converted into a lateral position by the downward traction of the food-filled sac, and the opening into the diverticulum becomes transverse so that swallowed food or introduced instruments (esophagoscope or bougie) pass directly into the sac and not directly into the esophagus itself.

This is well illustrated in Figure 1 of the large barium-filled sac of the diverticulum. Note in the illustration that the course of descent of the swallowed barium is directly into the sac, while the barium spilling over the edge of the transverse opening into the diverticular sac passes into the now lateral opening into the esophagus, and is shown as a thin tract of barium. This thin tract is the obstruction and the reason that patients who have large diverticula, as in this case, do not obtain adequate nourishment and for this reason lose weight.

Two hundred and seventy patients with esophageal diverticula were operated upon at this clinic; in 5 of the patients an esophagoscope or bougie had been pushed through the end of the sac at another clinic, resulting in mediastinitis. All of these patients have survived; 1 required a posterior mediastinotomy, 1 required multiple incisions in the neck and a gastrostomy, and all had a very narrow escape from a fatality. In presenting an explanation of this type of obstruction I have always called attention to the fact that since the opening into the true esophagus is at the side of the sac, it is impossible to manipulate an esophagoscope into the true esophagus as it will always go directly into the sac. I wish again to warn those who are inexperienced with esophageal diverticula and unaware of this fact that in those cases in which the opening into the esophagus is lateral, the introduction of the esophagoscope or an attempt to pass bougies is extremely dangerous, and persistence in pressure after the instrument or the bougie has entered the sac will result in perforation at its end.

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Fig. 1. Roentgenogram showing the size of the diverticulum. One can appreciate in a diverticulum of this depth that the apical pleura becomes adherent to and envelops the sac and that as occurred in this case, there is the danger of tearing it as the sac is separated from it.

Fig. 2. Note the diagnostic point that is true of all lateral views of esophageal diverticula, that the stream of barium passing into the esophagus comes from behind and from the upper part of the sac and not from the most dependent portion of the sac.

RUPTURE OF THE PLEURA IN DELIVERING THE SAC FROM THE CHEST

It must be remembered that, when the sac of the diverticulum is as large as it was in the present case (Figs. 1 and 2), the lower portion of the sac will be enveloped by, and adherent to, the pleura, that the pleura is a delicate structure, and that as the sac is pulled out of the chest and the pleura freed from it, there will be danger of tearing the adherent pleura, as unwittingly occurred in this case with such immediate effect upon the mechanism of breathing that cessation occurred.

Since intratracheal cyclopropane anesthesia was used in these patients, no serious difficulty was encountered; the anesthetists were able to continue respiration mechanically by means of the breathing bag. It was not until the sac was completely delivered that the wide rupture in the apex of the pleura with its partly collapsed lung beneath it could be demonstrated as the cause of the respiratory difficulty. The introduction of a large wet pack into the opening of the pleura to plug it temporarily permitted the restoration of respiration, and closure of the pleural rent was delayed until the diverticular sac was completely dissected at its neck and ready for implantation in the wound at the completion of the first stage of the operation.

Before the wound in the neck was closed the wet pack was withdrawn from the opening in the pleura, the anesthetist expanded the lung by positive pressure, and the torn edges of the ruptured pleura were, without difficulty, approximated by interrupted sutures of fine silk. A cigarette drain with a large strip of gauze projecting from its end was placed in the mediastinum, the sac was implanted in the wound, and the skin was closed about it as is the custom in the two stage operation. A No. 24 F. catheter was then introduced into the pleural cavity between the fourth and fifth ribs through a trocar, the lung was expanded by suction upon this catheter and the end of the rubber tubing connected with it was carried

into a bottle of water below the level of the patient (Fig. 3). This catheter was removed in 48 hours; there was no further collapse of the lung. The drain into the mediastinum was removed on the sixth day, with no further pulmonary collapse. There were no further complications as the result of the rupture and suture of the pleura.

Whatever our position may be regarding one or two stage operations in pulsion esophageal diverticula, and my favoring of the two stage operation is too well known to require repetition, its safety and advantages in a case such as this must be admitted. It is my opinion that the dangers of mediastinitis in the one stage operation are greatly increased in patients with large diverticular sacs since in these large sacs the opening into the esophagus where the sac joins that structure is large and its accurate suture and inversion difficult and uncertain. It is also made more dangerous by the very large cavity which remains in the mediastinum after removal of such large sacs from their position in the chest. It must be remembered that the neck of the diverticulum usually enters the esophagus in the midline in back—at the pharyngo-esophageal junction, that at this level where the esophagus joins the pharynx, the esophagus cannot be freely mobilized or rotated, and that adequate exposure and accurate suture of the esophagus after the sac is cut away is often extremely difficult and frequently far from accurate, thus exposing these patients to the risks of leakage and contamination of so deep an intrathoracic cavity. This is not to be feared when the sac is not cut away and its neck sutured into the wound. By this plan, the mediastinal cavity and fascia planes become walled off by protective granulations and adhesions and should leakages occur at the second stage, amputation and closure of the sac, they will not result in serious complications.

OVERDISTENTION OF THE IMPLANTED SAC BY SWALLOWED AIR

Ballooning of the sac (Fig. 4) is caused by the swallowing of air. We have seen this complication in several patients with large sacs after implantation in the neck and after the wound has been sutured about it. Continued

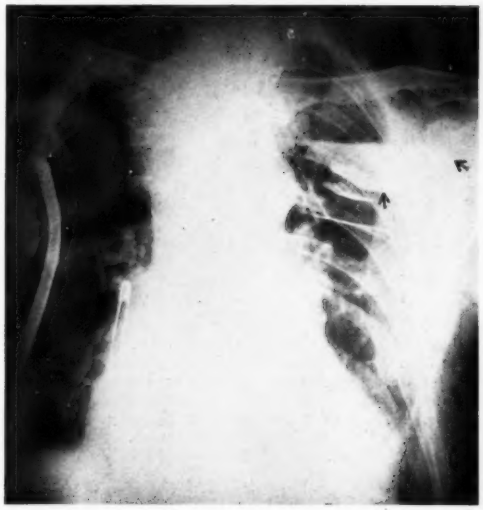

Fig. 3. This roentgenogram shows the catheter which was introduced into the right chest between the fourth and fifth ribs to re-expand the lungs after the pleura, torn at the time of operation, had been sutured. On the left side note the outline of the sac, as indicated by arrows, shown in a later illustration distended by air when it was implanted on the neck.

accumulation of air within the sac increases its volume and if distention is continued, gangrene of the sac will follow. As the result of the traction of the neck of the distended sac upon the esophagus itself, lateral traction exerted upon the esophagus will cause complete obstruction and interference with the intake of an adequate amount of fluid and nourishment.

Distention of the sac is immediately relieved by the introduction of a decompressing catheter by means of a pursestring suture into the sac (Fig. 5). At the end of 3 or 4 days when the wound has healed about the neck of the sac, the excess sac may be cut away (Fig. 6).

THE PROBLEM OF FEEDING THE PATIENT BETWEEN STAGES

In the present case because the diverticular sac was so large, together with the fact that the pleura had been opened and sutured, and also because, following the delivery of the sac from the mediastinum, there remained a large mediastinal cavity, the problem of feeding the

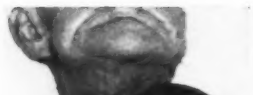

Fig. 4.

Fig. 5.

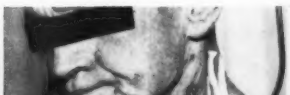

Fig. 6.

Fig. 7.

Fig. 4. Photograph of patient showing the distention of the sac with air, swallowed by the patient. This complication occurred between the first and second stages of the operation and made necessary decompression, as shown in Figure 5.

Fig. 5. The same sac as shown in Figure 4, after decompression by the introduction of a catheter.

Fig. 6. This view was taken after the major portion of the sac had been amputated at the end of the fourth day, thus permitting the manual introduction of a catheter through the neck of the sac into the esophagus and then on into the stomach. The patient was fed through this catheter until he was ready for the second stage removal of the sac.

Fig. 7. The wound is completely healed after the sac has been completely cut away and sutured at its neck.

patient between the first and second stages of the operation became a difficult one; consequent distortion of the course of the true esophagus made it impossible for the patient to swallow.

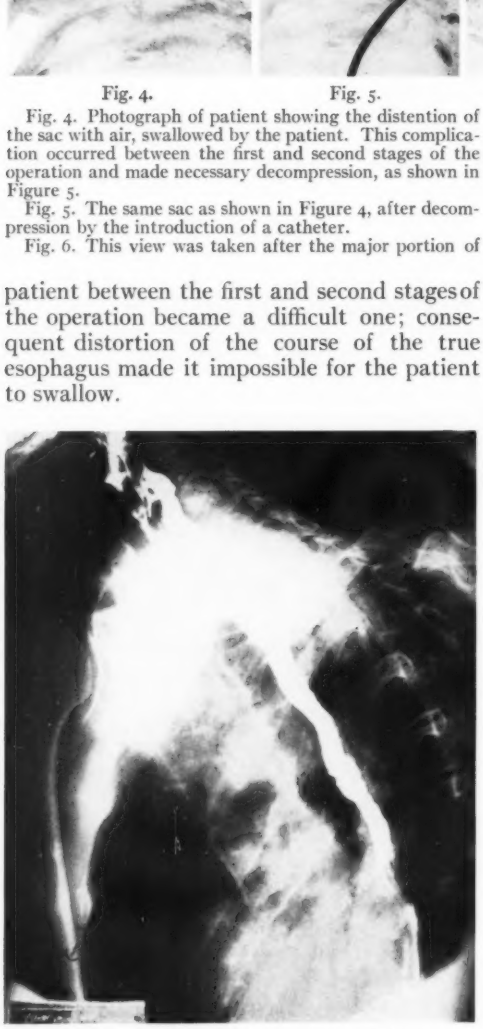

Fig. 8. A roentgenogram of the esophagus showing the final stage with the sac completely removed, the wound closed, and no defect remaining.

Since there remained a large mediastinal cavity at the bottom of which was a large, recently sutured rent in the pleura, it seemed wise not to do at the usual time, 7 days after the first operation, the second stage of operation, namely the reopening of the wound in the neck, the severing of the sac at its neck, and the suturing of the remaining opening in the esophagus, but to wait 2 weeks until the rent in the pleura was well healed and the large mediastinal cavity largely obliterated.

The feeding problem was easily handled in this case by cutting away the excess walls of the sac at the end of the fourth day when the walls of the implanted sac were firmly adherent to the wound in which the sac had been implanted and when the overdistended sac had been decompressed by the introduction of a catheter. Through this large aperture opening directly into the esophagus, a Levine tube could easily be guided by the finger directly into the stomach. Through this tube the patient was fed without difficulty until ready for the second stage of the operation, the removal of the remainder of the sac and the suture of the defect made in the esophagus by the cutting away of the neck of the sac (Fig. 6). With closure of the esophagus at the second stage operation and with wide exposure by reopening the original longitudinal incision in the neck by complete separation of the remaining implanted neck of the sac from the

edges of the wound, together with complete mobilization of the esophagus itself up to the point where the sac joined the esophagus, an accurate inversion suture in two rows of the open edges of the esophagus could be made. As is our custom, a tube was passed through the nose into the stomach, and the patient was fed for a week through this, at the end of which time the tube was removed. There was no leakage, the reopened wound had healed without difficulty (Fig. 7), and the patient was swallowing well. The roentgenogram (Fig. 8) shows that there is no remaining sac or obstruction.

It can be said, of course, that had this operation been done in one stage with immediate amputation of the sac and immediate closure of the opening into the esophagus made by the removal of the sac, some of the complications mentioned here would not have occurred, such as: overdistention of the sac with air, the need to decompress it, and the need to feed the patient by tube for the 15 day period between the first and second stages of the operation. Whatever one may think of one or two stage operations in patients with esophageal diverticula, if one has done many of them he must admit that in a patient in whom the pleura has been opened and sutured at the bottom of a cavity of such dimensions as present in this patient, the likelihood of a leak at the suture line in the esophagus would have been greatly multiplied. Whatever may be said about the relationship in this case, of the complications to the two stage procedure, the two stage plan did make possible the successful, safe handling of the complications without leakage and mediastinal infection.

SUMMARY

A case is presented of a large esophageal diverticulum which had a large intrathoracic sac.

The following complications occurring during the operation and their management are discussed: rupture of the pleura during the operation and its repair; overdistention of the implanted sac requiring decompression; partial amputation of the sac and introduction of a tube through the neck into the stomach; delay in second stage to permit healing of the pleura and the obliteration of the mediastinal cavity.

Roentgenograms and photographs are shown to illustrate some of the complications and the method of management.

CHEMOTHERAPY IN PERITONITIS DUE TO PERFORATION OF AN ABDOMINAL VISCUS

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THE use of the sulfonamides, penicillin, and streptomycin has done much to improve the results obtainable in the treatment of peritonitis secondary to contamination from the alimentary tract. Peritonitis of this type usually results from a perforation of some portion of the gastrointestinal tract from trauma, from infection, or from contamination during a surgical procedure. The infection is usually mixed, but the predominant causative organism is most often the colon bacillus.

The sulfonamides are not considered effective against the colon bacillus but are of considerable value in combatting numerous other organisms in the mixed infection group. However, sulfasuxidine and other sulfonamides are effective in reducing the Escherichia coli count of the stool when given orally, and it would seem that they would also be effective against the same organism in peritonitis.

Penicillin in its usual dosage is not effective against this type of peritonitis. However, in massive doses, it adequately controls these mixed infections. Just how this is accomplished is still not definitely determined, but the conclusions reached by Crile (4, 5) seem very logical. Bacillus coli and other penicillin-resistant organisms produce penicillinase which is an enzyme-like substance capable of inactivating penicillin. Usual doses of penicillin are not capable of overcoming this penicillinase effect of the Bacillus coli, but when large doses are given, this effect is overcome. Then penicillin becomes effective against the virulent gram-positive cocci although it theoretically does not inhibit the colon bacillus. This organism and most of the penicillin resistant organisms are not virulent or invasive and can be combatted effectively by the high natural resistance of the peritoneum when the virulent gram-positive cocci are controlled. Therefore, it is important that adequate amounts of penicillin be given early and continued for a sufficient length of time.

Streptomycin acts primarily on the gram-negative organisms and is effective in adequate dosage in peritonitis due to Bacillus coli but is not as effective as penicillin on other members of the mixed infection group. A disadvantage to streptomycin is that the toxic reactions are relatively frequent and permanent, whereas those to penicillin are minor and temporary.

The cases of this type of peritonitis during a 12 month period are presented with the amount of drug or drugs used and several important factors in treatment are discussed. We will also present what we consider an adequate chemotherapeutic regimen in peritonitis due to contamination from the gastrointestinal tract.

DISCUSSION

In reviewing the cases presented (Table I), several interesting conclusions can be reached regarding the value of chemotherapy in this type of peritonitis.

In cases in which the peritonitis was early and in which no purulent exudate was present in the peritoneal cavity, the dosage of penicillin needed was much smaller than in more advanced cases. This was evidenced in Cases 1, 2, 10, 13, and 15. It is probable, however, that even in these cases the initial dosage should have been greater because it is very important to obtain and maintain a high concentration of the drug at the onset.

In several of the cases, 200,000 units of penicillin were left in the peritoneal cavity. We feel that this is a valuable adjunct to parenteral therapy for it provides a high concentration at the site of contamination. Sulfathiazole crystals were left in the peritoneal cavity in several cases, and we think that it was of some value in combatting the mixed infections. Never more than 5 grams were used,

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and that was distributed carefully so that there was no lumping or caking of the crystals which would provide a large foreign body in the peritoneal cavity.

Sulfonamides were never used alone but always in combination with penicillin or streptomycin or both. In some of our cases they were not used at all, and the results were apparently not altered by the absence of the sulfonamides. Nevertheless, in cases of mixed infection, we do not feel that it can be omitted.

In several of our cases, streptomycin was used in moderate dosage although it may have been unnecessary in some instances. It was used initially in 3 cases of fulminating peritonitis (Cases 5 and 19) and was started on the second or third postoperative day in 4 cases (Cases 6, 11, 12, and 18), when there was still a sustained temperature elevation. The response in all cases was satisfactory.

One fact that needs emphasis is that prompt surgical intervention is necessary to eliminate the source of contamination to the peritoneal cavity. The exception to this is, of course, an instance in which the peritonitis appears to be well localized. Even in such a case, surgical intervention may be necessary to deflate the bowel if there is an obstruction (Cases 6 and 16) or to provide adequate surgical drainage. In some instances of ruptured appendices where the peritonitis was well localized with definite abscess formation, it was not feasible to remove the appendix at the time of incision and drainage. In these cases the appendix was removed later when all infection had subsided. Occasionally the appendix will be free in the abscess cavity and can be removed with no danger of spreading the infection.

An interesting fact was illustrated in Case 11 in which the penicillin dosage was decreased too soon, and there was an increase in the temperature elevation and also evidence of increased peritoneal irritation. The penicillin dosage was increased to the original amount and streptomycin was begun. The end-result was satisfactory, but several days were added to the hospital stay.

Our conclusions as to the dosage of these chemotherapeutic agents are as follows:

1. In early peritonitis with little contamination of the peritoneal cavity, 200,000 units of penicillin are left in the peritoneal cavity. Then 100,000 units intramuscularly are given preoperatively, and every 2 hours postoperatively for 10 to 12 doses. If by that time the temperature and the peritoneal signs are normal, the dosage is reduced to 100,000 units every 3 hours for 8 doses and then 50,000 units every 3 hours for another 48 hours.

The sulfonamides are not used ordinarily in this type of case and streptomycin is reserved for use if it appears that the penicillin is not accomplishing satisfactory results. This can usually be determined within 24 to 36 hours.

2. In cases of localized peritonitis with abscess formation, both penicillin in dosage of 50,000 to 100,000 units intramuscularly every 3 hours and sulfonamides in usual dosage either by mouth or intravenously are given both preoperatively and postoperatively. If contamination of the general peritoneal cavity is known or suspected after incision and drainage of the abscess, the penicillin dosage should be 100,000 units every 2 hours for as long as is necessary.

Penicillin and sulfonamides are both of value locally in the abscess cavity—200,000 units of the former and not over 5 grams of the crystalline form of the latter being the recommended dosage. In certain instances, it may be feasible to irrigate the abscess cavity with a solution of penicillin.

Streptomycin is reserved in these cases as in the first group for use if the penicillin and the sulfonamides seem inadequate.

3. In cases of advanced peritonitis where there is gross contamination of the peritoneal cavity with a purulent exudate present, we feel that all three drugs should be used as long as is necessary in adequate dosage as follows:

a. Penicillin 100,000 units intramuscularly every 2 hours with 200,000 units left in the peritoneal cavity at operation.

b. Streptomycin 0.1 gram to 0.3 gram every 3 hours in the usual case or as much as 0.5 gram every 3 or 4 hours in more severe cases.

c. Sulfonamides in usual dosage either by mouth or intravenously—usual dosage being approximately 1 to 1.5 grams every 4 hours. The crystalline form of the sulfonamides not exceeding 5 grams in amount may be used in the peritoneal cavity.

TABLE I.—SUMMARY OF CASES

File No. Case	Age Race Sex	Diagnosis	Operations	Hospital course	Chemotherapy—results
13,706 1	42 White Male	Ruptured duodenal ulcer. Generalized peritonitis, early	Repair of ruptured duodenal ulcer	Satisfactory. No complications. Discharged in good condition on the 15th postoperative day	Penicillin, 33,000 units I.M. every 3 hours for 5 days. Intravenous sodium sulfadiazine 5 gm. daily for 3 days. Satisfactory result.
86,708 2	8 White Female	Ruptured appendix. Early peritonitis, generalized	Appendectomy without drainage	Temperature 100° to 101° F. for 3 days. Discharged in good condition on the 6th postoperative day	Penicillin, 33,000 units I.M. every 3 hours for 5 days. Sodium sulfadiazine gm. 2.50 b.i.d. in intravenous glucose in N/S—satisfactory result
100,805 3	46 White Female	Ruptured appendix. Localized peritonitis and abscess formation	Incision and drainage of appendiceal abscess. Appendectomy	Admitted with diagnosis of pelvic abscess of appendiceal origin. Treated conservatively with chemotherapy for one week—then incision and drainage of appendiceal abscess with removal of sloughed-off appendix. Ran a febrile course for 2 days Discharged in good condition on 22nd postoperative day	Penicillin, 50,000 units every 3 hours for 25 days. Sulfadiazine in adequate dosage. Satisfactory result
104,693 4	4 White Male	Ruptured appendix. Generalized peritonitis (purulent)	Appendectomy with drainage	Stormy course with temperature 101° to 103° for 8 days. Poor nutritional status. Intensive supportative treatment. Discharged in good condition on the 20th postoperative day	Penicillin, 33,000 units I.M. every 3 hours for 2 days—then 50,000 units I.M. every 3 hours for 15 days. Sodium sulfadiazine intravenously in usual dosage for week. Satisfactory result.
141,257 5	12 White Female	Generalized peritonitis with multiple abscess formation. Fecal fistula. Subhepatic abscess (drained previously). All of 6 weeks' duration on admission to this hospital and secondary to appendicitis and peritonitis with appendectomy	Appendectomy (done elsewhere prior to admission to our service). Incision and drainage of subhepatic abscess (done elsewhere prior to admission to our service). Exploration for possible abscess in pelvic region	Very poor condition on admission here Temperature elevation 104° to 106° but gradually dropped to normal on the 24th day. Numerous transfusions of plasma and whole blood given. General condition was apparently very satisfactory when she developed a fulminating hepatitis with intense jaundice which progressed rapidly. Patient expired within 48 hours on the 45th hospita lday	Penicillin, 100,000 units every 2 hours for about 6 weeks. Streptomycin 0.1 gm. every 3 hours for about a month. Sulfadiazine in usual dosage for 3 to 4 weeks. Patient expired on 45th hospital day Autopsy revealed cause of death to be acute yellow atrophy of liver. Peritonitis had completely cleared and only numerous peritoneal adhesions remained
14,067 6	61 White Female	Ruptured diverticulum of sigmoid with complete intestinal obstruction and localized peritonitis	Cecostomy. Sigmoidoscopy.	Was stuporous prior to operation and in poor condition, however, responded remarkably after deflation of the bowel. Temperature spiked to 104° for 2 days and gradually returned to normal by the 6th postoperative day	Penicillin, 100,000 units every 2 hours for 10 days; then 100,000 units every 3 hours for 2 days. Then 50,000 units every 3 hours for 30 days. Streptomycin 0.5 gm. every 4 hours for 5 days. Sulfadiazine in usual dosage. Patient responded well; was discharged for 2 months and returned for closure of the cecostomy with satisfactory results.
126,639 7	57 White Male	Perforated duodenal ulcer. Early peritonitis	Repair of perforated duodenal ulcer	Postoperative course was quite satisfactory until 4th postoperative day when he developed a mild respiratory infection that responded to penicillin by nebulizer. Temperature was never over 101° and was normal on the 6th day	Penicillin, 100,000 units every 3 hours for 6 days—and penicillin via nebulizer for 4 days. Patient responded readily to treatment and was discharged in good condition on the 13th postoperative day
9306 8	17 White Male	Appendiceal abscess	Incision and drainage of appendiceal abscess	Postoperative course was uneventful Had considerable drainage for 2–3 weeks. Temperature was 101° to 102° for 2 days and then gradually became normal on the 3rd postoperative day	Penicillin, 50,000 units every 3 hours for 7 days. Sulfadiazine in usual dosage. Patient responded readily and was discharged on the 7th postoperative day. Returned 2 months later, and an appendectomy was done
141,489 9	3 White Male	Ruptured appendix. Generalized peritonitis. Subphrenic abscess	Appendectomy with drainage. Incision and drainage of subphrenic abscess. Enlargement of drainage tract of subphrenic abscess	Patient ran a sustained temperature elevation of 101° to 103° for 16 days which gradually became normal on the 27th day. Subphrenic abscess was drained on the 7th and 14th days	Penicillin, 100,000 units intramuscularly every 4 hours for 1 month. Penicillin to irrigate subphrenic abscess cavity. Sulfadiazine in usual dosage. Discharged in good condition on the 30th postoperative day
123 10	40 White Female	Ruptured appendix. Generalized peritonitis, early	Appendectomy without drainage	Sustained temperature elevation to 100° F. for 5 days. Normal on 6th postoperative day	Penicillin, 100,000 units every 3 hours for 8 doses; then 50,000 units every 3 hours for 7 days. Sulfadiazine in usual dosage for 6 days. Discharged in good condition on the 13th postoperative day

TABLE I.—SUMMARY OF CASES—Continued

File No. Case	Age Race Sex	Diagnosis	Operations	Hospital course	Chemotherapy—results
125,468 11	2 White Male	Ruptured appendix. Generalized peritonitis, (purulent).	Appendectomy with drainage	Temperature of 103° gradually dropped to normal on the 2nd postoperative day. Rose again on the 5th day and remained between 101° and 103° for 5 days; then became normal and remained so	Penicillin, 100,000 units every 2 hours for 2 days; then 50,000 units every 3 hours. Sulfadiazine in usual dosage. Streptomycin 0.1 gm. every 3 hours—for 7 days—started on 9th postoperative day at height of second temperature rise. Discharged in good condition on 18th postoperative day
145,138 12	40 White Male	Ruptured appendix. Early peritonitis, localized	Appendectomy without drainage	Temperature elevation 101° to 102° for 3 days. Normal on 3rd postoperative day. Discharged in good condition on the 6th postoperative day	Penicillin, 100,000 units every 2 hours for 5 days. Sulfadiazine in usual dosage. Streptomycin 0.1 gm. every 3 hours for 3 3 days. Satisfactory result
145,768 13	29 White Male	Perforated duodenal ulcer. Early peritonitis, generalized	Repair of perforated duodenal ulcer	Smooth course—no temperature elevation. Discharged in good condition on 9th postoperative day	Penicillin, 50,000 units every 3 hours for 9 days. Satisfactory result
145,684 14	54 Colored Male	Ruptured appendix with localized abscess. Peritonitis, generalized	Incision and drainage of appendiceal abscess	Temperature elevation 100° to 103° for 5 days. Normal on 6th day. Discharged in good condition on the 11th postoperative day—to return in 6 weeks for an appendectomy	Penicillin, 200,000 units left in peritoneal cavity at time of operation. Penicillin, 100,000 units I.M. every 2 hours for 10 days; then 100,000 units every 4 hours for 2 days. Sulfadiazine in usual dosage. Satisfactory result
72,181 15	21 White Male	Ruptured duodenal ulcer. Early peritonitis, generalized	Repair of ruptured duodenal ulcer	Temperature elevation 101° to 102° for 4 days. Due in part to flare-up of chronic bronchiectasis which responded readily to penicillin via nebulizer. Discharged in good condition on 10th postoperative day	Penicillin, 200,000 units left in peritoneal cavity. 50,000 units penicillin I.M. every 3 hours. Satisfactory result
104,057 16	48 White Male	Intestinal obstruction (colon) due to ruptured diverticulum. Localized peritonitis. Diabetes mellitus	Appendicostomy. Appendectomy.	Quite ill on admission with marked abdominal distention. Sustained temperature of 99° to 100°. Improved rapidly after deflation of bowel and chemotherapy begun. Discharged in good condition on 31st hospital day	Penicillin, 50,000 units every 3 hours for 8 days. Local irrigation of appendicostomy wound with penicillin solution. Sulfasuxidine in usual dosage when oral medications could be taken. Satisfactory result
61,632 17	49 White Female	Perforation of rectum Generalized peritonitis	Repair of perforation of rectum. Colostomy	Extremely ill—shock. Peritoneal cavity grossly contaminated with fecal material. Sustained temperature elevation of 99° to 100° for 10 days. Discharged in good condition on the 34th postoperative day	Penicillin 200,000 units left in peritoneal cavity. 100,000 units every 3 hours I.M. for 10 days; then 100,000 units every 4 hours for 7 days. Sulfathiazole crystals 5 gm. in peritoneal cavity. Sulfasuxidine in usual dosage. Patient was discharged in good condition and returned 2 months later for closure of colostomy
97,258 18	14 White Female	Ruptured appendix. Early peritonitis, generalized	Appendectomy without drainage	Temperature 100° to 101° for 4 days; then normal. Discharged in good condition on the 11th postoperative day	Penicillin, 200,000 units left in peritoneal cavity. Penicillin 100,000 units every 2 hours for 10 days. Streptomycin 0.1 gm. every 3 hours for 4 days. 2.5 gm. sulfathiazole crystals left in peritoneal cavity. Sulfadiazine in usual dosage. Satisfactory result
146,489 19	32 Colored Male	Ruptured appendix, walled off. Paralytic ileus due to infection	Appendectomy without drainage	Admitted to hospital in state of shock—abdomen markedly distended, tender, rigid. Temperature 96°. After operation temperature rose to 101° and became normal gradually on the 6th postoperative day. Discharged in good condition on the 8th postoperative day	Penicillin 200,000 units in I.V. glucose in normal saline prior to operation. Streptomycin 0.1 gm. every 3 hours I.M. for 7 days. Sodium sulfadiazine 5 gm. in I.V. glucose b.i.d. for 6 days. Satisfactory result
145,964 20	68 Colored Female	Ruptured appendix with abscess. Generalized peritonitis, purulent, late	Incision and drainage of appendiceal abscess and generally contaminated peritoneal cavity	Admitted to hospital with marked distention of abdomen, tenderness and rigidity. General condition poor. Temperature 99.4° on admission. Ranged between 99° and 101° for 3 weeks; then became normal. Has had considerable purulent drainage. General condition good	Penicillin 200,000 units in peritoneal cavity at operation. Penicillin 100,000 units every 2 hours I.M. for 19 days; then 50,000 units every 3 hours for 7 days. Streptomycin 0.1 gm. every 3 hours for 19 days. Sodium sulfathiazole 5 gm. in peritoneal cavity at operation. Result satisfactory. Patient will have appendectomy at later date

NOTE.—Several cases of acute appendicitis, perforated, adequately sealed off at operation by a portion of the omentum were not included since the appendix and the involved omentum were removed without contaminating the peritoneal cavity. Prophylactic chemotherapy was used in some of these cases.

SUMMARY

1. The effectiveness of chemotherapy in peritonitis secondary to contamination from the alimentary tract has been discussed.

2. A chemotherapeutic regimen for this type of peritonitis has been outlined.

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THE TREATMENT OF ACUTE RENAL INSUFFICIENCY

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A SERIES of different conditions are associated with acute bilateral renal damage and acute renal insufficiency. The syndrome resulting from this type of renal lesion has been designated by different terms such as "renal anoxia syndrome" (18), "lower nephron nephrosis" (14) and "hemoglobinuric nephrosis" (20). It has been frequently stressed in various publications that once renal insufficiency is definite the mortality rate in this group of cases is very high. Thus, Lucké placed the mortality rate near 90 per cent and Mallory stated that with persistent oliguria and hypertension the chance of survival was not much more than 20 per cent.

From a clinical viewpoint it appears that the most common condition associated with this lesion is that of prolonged hypotension, particularly that due to oligemia. In a general hospital one may encounter such cases following copious hemorrhages as in traumatic, operative, and obstetrical cases. It was the frequency of circulatory failure in the various conditions associated with acute renal insufficiency that led Maegraith and coworkers (17, 18) to the conclusion that renal anoxia constituted the main cause of the renal lesion. Other conditions associated with similar renal changes include incompatible (hemolytic) blood transfusions (27), the crush syndrome (2), blackwater fever (5), burns (8), severe alkalosis (21, 23), carbon tetrachloride poisoning (29), heat stroke (19), sulfonamide intoxication (7), severe pyrogenic reaction (1) and transurethral prostatectomy with water hemolysis (4, 22).

In reported cases there has been a frequent attempt to stimulate the kidneys to produce urine during the oliguric period. A common measure used for this purpose has been a prominent fluid intake, with or without added salt. In many cases generalized edema and acidosis have been outstanding features of the syndrome, pulmonary edema being striking.

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Most patients have expired within 8 days (14). Morphologically it has been noted that regeneration of renal tubules is well advanced by the eighth to twelfth days (14, 18, 20, 27). Patients surviving this interval frequently recover. Whether most patients can be sustained through this interval without the aid of artificial measures, such as peritoneal irrigation (6) or the Kolff artificial kidney for in vivo dialysis (13), becomes a very pertinent question. It is our belief that much of the high mortality can be ascribed to the management used and that, therefore, this question should be answered in the affirmative. It is proposed to present additional evidence supporting such a stand in the form of 3 closely studied, previously unreported, cases with severe renal insufficiency, 2 following incompatible blood transfusions and 1 following a prolonged operation and hypotension.

CLINICAL COURSE

As previously discussed (27), the clinical course of such cases may be divided into 3 phases.

Phase 1. This is the phase during which renal damage apparently occurs (18, 24, 27, 31). The most common single happening at this time is that of hypotension or circulatory failure. In incompatible transfusion cases this is the phase of acute onset with hemolysis (hemoglobinemia —hemoglobinuria). In the latter event hypotension may be transient but frequently is prominent (27). The hypotension may be associated with mental signs of the shock state (26) or the patient may be quite lucid throughout. In operative cases the anesthetic naturally obscures this latter clinical manifestation.

This is a short-lived phase lasting a few hours at most, as the immediate recovery from this phase depends on the recovery from the hypotension or shock state.

Phase 2. The second phase is that of renal insufficiency. Oliguria (or anuria) and azotemia are the outstanding manifestations dur-

ing this period. In association with the oliguria and azotemia major abnormalities occur.

a. Urinary findings: Anuria is an infrequent finding in cases without additional complications. The oliguria is very pronounced in severe cases but is seldom fixed in amount. In most cases without water-salt overload or other complications, there is a gradual increment in the urinary volume during the first 5 to 8 days. Then there usually occurs more prominent daily increments in the urinary output and a peak in the diuresis occurs between the eighth to fourteenth days (average twelfth day).

The urine specific gravity soon becomes fixed at a low range (often 1.005–1.010). The solid output in the urine is very low. Thus the urine urea concentration may be lowered to 10 to 20 per cent of normal and the urinary chloride concentration becomes fixed at low levels. This renal inability to excrete salt has much implication. The combination of oliguria and hyposthenuria makes for negligible renal clearance during this phase.

During the first few days (usually 3 to 5) the urine contains pathologic ingredients. Proteinuria may be quite prominent, early being as high as 500 to 1000 milligrams per cent and lowering gradually. The presence of intact red blood cells is not unusual and white cells are usually seen in varying numbers, frequently clumped. Casts may be prominent early and are usually granular. Degradation products of hemoglobin or myoglobin may occur within casts depending on the type of case. The heme casts gradually decrease in number during the first week after an incompatible transfusion.

The reaction of the urine is usually acid.

b. Blood and serum findings: Azotemia becomes prominent early. It is not unusual for the blood urea concentration to reach 80 to 100 milligrams per cent during the first 2 days and to attain a peak of 300 to 400 milligrams per cent within 5 to 7 days. At the same time there is a distinct tendency toward acidosis as indicated by a decline in the plasma bicarbonate concentration. The blood chlorides and serum sodium concentration are lowered. The hyponatremia may be quite prominent despite a substantial intake of sodium bicarbonate (see Case 1). The serum potassium concentration may be moderately elevated early, particularly in hemolytic transfusion cases, but in our experience has seldom been very high. Again a moderate intake of potassium is not necessarily attended by a prompt rise in the serum potassium concentration (see Case 1). There are mechanisms therefore that tend to lower the serum sodium and potassium concentrations even with additional intakes of these ions and in the absence of hydremia. Also the hyponatremia and hypochloremia are not necessarily of similar proportions. A significant lowering of the calcium concentration has not been observed in uncomplicated cases. The patients developing this lesion are not infrequently anemic, most often a blood loss anemia.

In hemolytic transfusion cases the hemoglobinemia and hemoglobinuria recede during the first 36 hours. The demonstration of methemalbumin in the serum by spectrophotometric analysis is considered as clearcut evidence of prominent intravascular hemolysis. An elevated serum bilirubin concentration (or icterus index) may be demonstrated during the first 2 days (Case 2). An additional evidence of incompatible hemolysis is gained by the demonstration of a rising titer of antibodies against cells of the type transfused. The existence of the various orders of antibodies (first, second, and third) (10) should be searched for in such studies.

c. Clinical appearance: There can be little doubt that the clinical appearance of the patient during the first week is greatly influenced by the type of management (27). Patients without added complications, particularly water or water-salt overload and acidosis, in our experience have not developed the prominent cerebral signs as frequently described. Mental clarity has been observed repeatedly despite severe grades of oliguria for 5 to 8 days. At times, however, the more severe cases have displayed slight mental dullness. Coma, irrational loud talk, muscular twitchings, and convulsions have been complications in overhydrated cases. Moderate hypertension is a common finding during the renal insufficiency phase. More striking elevations in the blood pressure have been observed in patients with

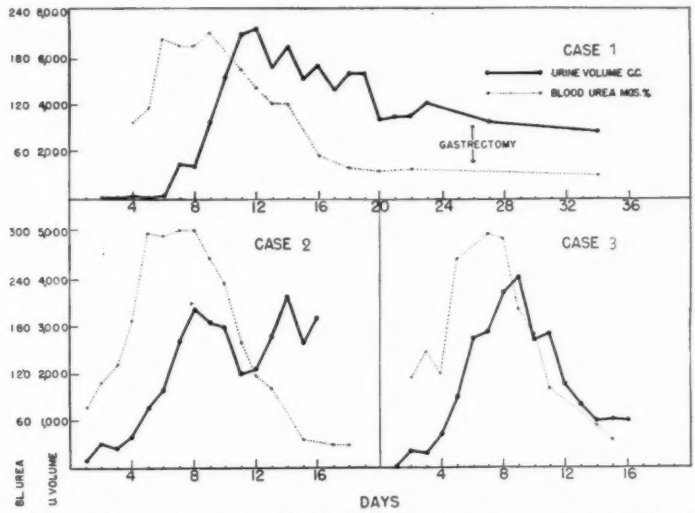

Fig. 1. There are two features depicted, the oliguria-diuresis curve and the blood urea concentration (azotemia). Case 1 with anuria and marked oliguria had the peak of the diuresis on the twelfth day; Cases 2 and 3 with less marked oliguria had the peak on the eighth and ninth days, respectively. The sharp recession in azotemia began with the peak of the diuresis.

a fluid overload. Thus, 2 patients treated by peritoneal irrigation and displaying definite edema had a blood pressure of 160/110 and 170/90 millimeters of mercury (28). In the former case diuresis was followed by a blood pressure recession to 120/85 millimeters of mercury.

Phase 3. The third phase is that of diuresis and constitutes the early period of recovery. The diuresis tends to be copious and may be associated with prominent excretion of salt from the body, i.e. salt losing diuresis. The extent of the diuresis and salt loss seem to be related to the severity of the oliguria of the second phase (compare Case 1 with Cases 2 and 3). The daily salt loss may amount to 20 to 40 grams.

After the copious diuresis there is usually a period of prolonged renal convalescence during which polyuria persists. The renal clearance may remain depressed for a varying period. In a few instances where this feature has been studied by us the renal function returned to near normal within 2 to 4 months.

Additional features: The urinary volume computed against time in days describes a characteristic curve that may be designated as the oliguria-diuresis curve. In any isolated example the daily plotting of this curve can be used to designate the progress and to yield significant information concerning the prognosis (Fig. 1). Thus, in cases responding satisfactorily one expects to observe a daily increment in the urine volume and definite diuresis between the eighth and twelfth days. The absence of such a trend not only seems to indicate a poor prognosis but may indicate additional complications (27). In our experience attempts to modify this curve by measures which normally stimulate the kidneys to produce urine have failed (27). The characteristics of this curve, apparently based on the functional recovery of the kidneys, correlate well with what is known about the morphologic changes in the kidneys, that is, alterations that early depict damage and later regeneration and recovery.

The ability of the kidneys to regain their concentrating power early seems to be a good prognostic sign. In the more advanced cases only rarely does the specific gravity regain a normal or near normal level during the early

TABLE I.—LABORATORY STUDIES, CASE 1

Day	Blood urea mgm. %	CO_2CP Vols. %	Blood Cl mgm. %	Serum Na mEq/L	Serum K mEq/L	Fluid intake c.c.	Urine vol. c.c.	Urine urea mgm. %	Urine Cl (Na Cl) mgm.%	Urine Na mgm.%	Urine K mgm.%	RBC Mil.	Hgb. gm. %
4	97.5		450			1050	90					2.15	7.7
5	118	64				1940	75						
6	215	58	440	122	6.4	2490	150	353	360			2.46	8.2
7	200	53	440	128	6.3	1660	1450	350	320			2.09	8.5
8	200		420	128.4	6.1	1600	1400	258	80				
9	220	42	440			1100	3300	289	360				
10						4350	5300	278	300	240	78		
11	170		420	130.4	5.9	6900	7350	412	280	206	73		
12	145	56	480			7800	7550	442	240	150	24		
13	129	56	520	145.6	4.6	7650	5700	333	260	165	40		
14	129		500			6500	6800	453	200	190	15		
15						4900	5300			122.5	57	2.57	8.2
16	54	56	520			5400	5800	422	240	125	78		
17						5900	4700	364	240	170	53		
18	40			141	5.6	7600	5500	364	260	167.5	47		
19				140	4.9	6100	5500	163	320	166	37	3.82	12.1
20	36	54	540			5000	3500	278	420	190	48.5		
21						4800	3600	474	480	195	86		
22	38		520	141	4.9	4400	3600	342	840	315	29	4.4	14
23						4700	4100						
27						2000	3400						14.4
34	30			146	4.9	4300	3000	1118	480	130	4		

phase of recovery. The specific gravity, therefore, may fail to indicate the true progress. The ability of the kidneys to concentrate urea, on the other hand, seems to be a good prognostic sign (Fig. 2). Thus, in properly recovering patients it has been observed (27) that the urine urea concentration may change from 10 to 20 per cent of normal during oliguria to 40 to 75 per cent of normal during the diuresis. The concentration of salts in the urine does not appear to be as applicable as a prognostic sign.

RENAL LESIONS

Grossly the kidneys when observed at autopsy are found to be of increased weight, not infrequently by a factor of two. Much of the increase in weight seems to be due to a greater water content (12). On section the cut surface bulges and the margins retract, thereby indicating an increased subcapsular tension. The cortex is pale gray and rather friable. The medulla is well striated and purplish in color. The pyramids are thus made prominent. Microscopically the findings vary in accordance with the time interval since the initial injury. The greatest brunt of the injury is sustained by the distal segment of the nephron. Early (first few days) one may observe degenerative changes and focal necrosis in this segment. The areas of necrosis initiate focal inflammation. There may be tubulovenous connections (15) and partial thrombosis of thin walled veins. Heme cast in this area vary in number and are particularly prominent in hemolytic cases. The glomeruli appear intact morphologically but protein material in the capsular spaces indicates glomerular membrane damage. The proximal segment is the least affected, but may demonstrate degenerative changes. Interstitial edema may be prominent. Medullary peritubular venocapillary hyperemia is outstanding. Between the eighth and tenth days regeneration is well advanced (27). The newly regenerated cells are flat but

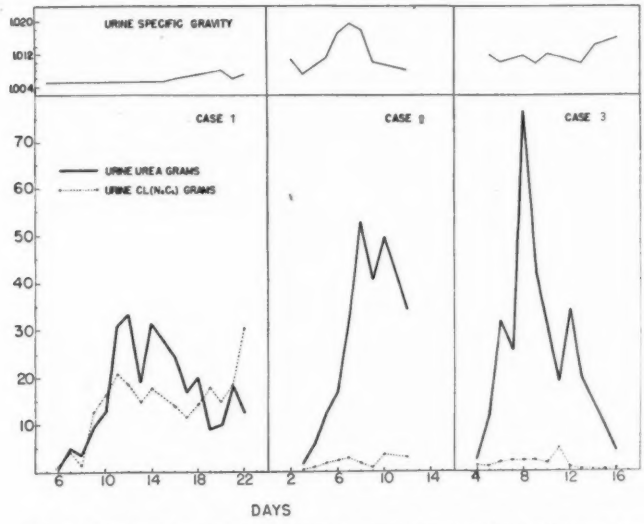

Fig. 2. Case 1 with a persistent low urine specific gravity (and urine urea concentration) had a prominent salt output during the diuresis. Cases 2 and 3 with normal or near normal urine specific gravity (and urea concentration) had a low salt output during the diuresis. The urine urea output was not as prominent in Case 1 (lower concentration, starvation) as in the 2 other cases (normal concentration, lack of starvation).

soon gain more and more substance. Experimentally (30) by the twenty-first day the regenerated epithelium appears near normal. Focal granulomatous lesions and scars may develop. During this recovery phase desquamated epithelial cells and casts apparently gradually creep into the renal pelvis and pass out in the urine.

The morphologic studies demonstrate three important points. First, early there may be not only degeneration but outright necrosis of tubular cells. Second, regeneration is well established between the eighth and tenth days. Third, a near normal appearance is regained by many tubules by the twenty-first day. These pathogenetic changes correlate well with the clinical course. Both clinical and morphologic aspects are taken to possess strong therapeutic implications.

CASE REPORTS

Three additional closely observed cases belonging in this category are being reported. Each patient exhibited distinct signs of renal insufficiency and in accordance with conventional appraisal can be considered to have had a poor prognosis. In each instance there occurred a very satisfactory recovery and each patient was discharged from the hospital in an ambulatory state. It is believed that the satisfactory outcome was implicitly related to the therapeutic management of these patients. In the "Discussion" the question of "severity" of these cases will be further elaborated. The type of cases are as follows: (1) severe hemorrhages followed by an incompatible (hemolytic) blood transfusion; (2) extensive operation followed by an incompatible (hemolytic) blood transfusion; and (3) an extensive chest operation with multiple periods of hypotension.

CASE 1. (Dr. A. W. Terrell.) A white male, 47 years old, gave a long history of epigastric distress (10 to 15 years) with intermittent episodes of voluminous vomiting. These episodes usually yielded to medical treatment and rest. Repeated x-ray examinations were said to have demonstrated a large dilated stomach, but no definite organic lesion. During the preceding 3 years, he had had intermittent hematemesis and black tarry stools.

The present episode began 2 weeks ago and consisted of epigastric discomfort, occasional vomiting, and evidence of continual bleeding. Four days ago

the patient was admitted to another hospital and was given two blood transfusions. The first transfusion was uneventful. The second transfusion, 3 days ago, was discontinued after about 100 cubic centimeters had been given because of a severe reaction. The onset was sudden with chill, headache, generalized tingling sensations, vomiting, and fever. The state of the blood pressure at the time of the reaction is not known. There was no urinary output for 48 hours. On the third day the urine passed (exact amount not known) was dark brown in color. The next urine passed was on the fourth day (90 c.c.). During the first three days, and prior to admission to the present hospital, the intake consisted of small amounts of milk, water and soup by mouth most of which was said to have been vomited. During the first 12 hours after admission the patient was given 2,000 cubic centimeters of 5 per cent dextrose in distilled water. The subsequent findings are depicted in Table I.

This patient was placed on a regimen which has been described (27). Despite a prominent anemia, it was decided not to give additional transfusions as previously emphasized until later because of a marked anxiety by the patient toward transfusions. The blood pressure was normal and other circulatory features appeared well compensated. Essentially the regimen in this case amounted to (a) an attempt to limit the daily fluid intake to that immediately lost, (b) the prevention of sustained acidosis and, (c) allowing the kidneys to recuperate without any attempt "to stimulate" them into urine production prematurely.

The attempt to replenish the daily loss was not completely successful as can be determined from Table I. During the 13 days between the fourth and sixteenth days, the average daily fluid intake over and above the urinary output (for insensible loss) was 350 cubic centimeters. The latter figure includes the fact that between the ninth and eleventh days there was a definite deficit. It is considered that this volume fell short of the actual insensible loss by at least about 50 per cent, thus accounting for the minimal signs of extracellular dehydration exhibited by the patient. Despite this deficit the course of the patient was very satisfactory.

The advanced pyloric stenosis prevented the proper oral administration of fluids and nourishment. Between the sixth and seventeenth day an average of 870 cubic centimeters of milk and cream formula were taken orally daily and thereafter about 1000 cubic centimeters of the same formula were taken daily. During the same period the patient averaged a daily intake of 3.6 grams of sodium bicarbonate by mouth, all of which was retained. There was an adequate daily intake of vitamin C and B complex.

On this regimen, and despite a moderate water deficit, the patient had a marked diuresis by the twelfth day. Severe oliguria had existed for 6 days. Concomitantly with the diuresis the azotemia abated promptly (Fig. 1). Throughout the entire course the patient was mentally clear and at the height of the oliguria and azotemia he was able to read periodicals at intervals throughout the day.

In Table I it can be noted that at no time was there severe acidosis. The serum sodium concentration was low early and was elevated to normal levels after the peak of the diuresis was attained. Between the sixth and the ninth days the patient received 23 grams of sodium bicarbonate by mouth and despite having an extracellular water deficit, the serum sodium concentration was not elevated to the lower limits of normal at this time. The serum potassium concentration was slightly elevated early. This was perhaps related to the hemolysis. The potassium concentration gradually receded to the normal range. After the fifth day and while renal insufficiency was still prominent the patient received about 1 gram of potassium daily in the milk used in the ulcer regimen. As in the case of sodium, despite this intake of this cation, there was a gradual recession in its concentration as previously noted (27). The blood chloride concentration revealed a pattern similar to that of the serum sodium concentration.

The urine specific gravity (Fig. 2) in this case remained depressed throughout the hospital stay. (1.005-1.008). Until the thirty-fourth day the urine urea concentration was likewise depressed (14 to 26 per cent of normal). There was a gradual increase in the daily urinary output of urea and chlorides (as NaCl) until substantial quantities were excreted during the diuresis, mainly as a result of the copiousness of the diuresis. The excretion of sodium and potassium was likewise prominent during this period.

The anemia was marked early. Subsequently as a result of 1300 cubic centimeter transfusions and bone marrow regeneration, the anemia was eradicated.

On the twenty-sixth day because the patient continued to display evidence of severe pyloric obstruction a gastrectomy was performed (Dr. J. V. Goode). The operation lasted 4 hours. Convalescence was rapid and satisfactory and the patient was discharged from the hospital ambulatory 35 days following the reaction. Ten months later the patient was continuing to do well.

In this case there was a severe blood loss anemia and acute renal insufficiency following an incompatible (hemolytic) blood transfusion. The case is appraised as a severe one for the following reasons: (1) marked oliguria for 6 days, (2) persistently low specific gravity of urine and low urine urea concentration, (3) marked azotemia and, (4) peak of diuresis on the twelfth day. The patient recovered very satisfactorily on a regimen which maintained a fair level of hydration, but did not attempt to force diuresis. Time was allowed for renal recovery and regeneration. The tendency toward acidosis was curbed with sodium bicarbonate. The diuresis occurred despite a

TABLE II.—LABORATORY STUDIES, CASE 2

Day	Blood urea mgm %	CO_2CP Vols. %	Plasma Cl mEq/L	Serum Na mEq/L	Serum K mEq/L	Fluid intake c.c.	Urine vol. c.c.	Urine urea mgm %	Urine Cl (Na Cl) mgm %	Urine Na mgm %	Urine K mgm %	Hgb. gm. %	Icterus index
1	77.7	65	103.5			4800	132						38
2	109	81.9	92.1			1000	535						14
3	132	77.3	90	129	6.0	3250	400	418	80				
4	188	64.5	95.4	138	4.7	2150	640	850	100			9.2	
5	298	59.8	96.9			2300	1250	944	120	99	103		
6	291	65.3	108.6			3700	1625	1003	120	74.5	100		
7	300	59.3		139		5400	2600	1228	100	77.5	106		
8	300	47.6				6000	3300	1583	50	69	104		
9	270	57.8	99.9	133	4.8	5200	2950	1374	21	32.5	86	8.7	
10	242	58.7	100.2	146	4.4	2800	2900	1701	103	54	94		
11	161	65.2	103.5			2800	1900						
12	118	70.8	105			4100	2000	1684	135				
13	103	61.5	103			3880	2720						
14						4410	3550						
15	36	82.8	99			3660	2550						
16						3830	3100						
17	30	85.7	92.4			3400	3500						
18	30	80	92.4			4640	4050						
19	26	84.7	92	139	4.1	4650	4750						
20													
21	19	81	95.7										

moderate water deficit. During the diuresis attempts were made to replace the fluid loss in the urine and the insensible loss. As much as 20.5 grams of salt were lost daily in the urine at this time.

It is believed that this case is the first one reported as having undergone very successfully a major operation soon after recovery from severe acute renal insufficiency. That this procedure was justified is attested by the rapid postoperative recovery.

CASE 2. (Dr. W. F. Mengert.) This patient, a 42 year old colored female with a carcinoma of the body of the uterus was seen in another hospital. Two days prior to hysterectomy 500 cubic centimeters of blood was given without any reaction. The operation lasted 5 hours and immediately afterward 500 cubic centimeters of blood were given. Just as the transfusion was terminated the patient developed a severe chill and the temperature rose to 104 degrees F. Later 100 cubic centimeters of cloudy dark brown urine were obtained by catheter. On recheck it was learned that the patient was of type O and the infused blood was of type A.

Prominent oliguria, azotemia, urinary casts, hypertension and hyperbilirubinemia developed (see Table II). A decrease in serum sodium and blood chloride concentration also occurred.

On the first day the patient received fluid in excess of the immediate needs but this abnormality was corrected by decreasing the intake on the second day. Thereafter the fluid intake was made to equal the estimated insensible loss, loss through visible sweating and the urinary output. The renal insufficiency phase developed while the environmental temperature fluctuated between 90 and 108 degrees F and consequently the intake was increased accordingly. The fluid intake included 1500 to 2000 cubic centimeters of a liquid formula[1] of low salt content and approximately 1 calorie per cubic centimeter. During the renal insufficiency phase 24 grams of sodium bicarbonate in 6 doses were given and acidosis was not a problem in this case. One 500 cubic centimeter blood transfusion (no reaction) and daily supplements of vitamin B complex and vitamin C constituted the only additional measures.

The urinary output began to rise sharply on the fourth day (Fig. 1) and the peak of diuresis occurred on the eighth day. Beginning on the eighth day there was a precipitous recession of the azotemia. The patient was placed on a soft diet by the seventh day and on a general diet by the ninth day.

In this case there was no anuria and the oliguria was not as prominent as in Case 1. There were three

[1]There are several such preparations available on the market.

TABLE III.—LABORATORY STUDIES, CASE 3

Day	Blood urea mgm.%	CO_2CP Vols.%	Blood Cl mgm.%	Serum Na mEq/L	Serum K mEq/L	Fluid intake c.c.	Urine vol. c.c.	Urine urea mgm.%	Urine Cl (Na Cl) mgm.%	RBC mil.	Hgb. gm.%
1							0(?)			5.01	15.4
2	115					2700	355			5.63	16.75
3	150	60	420			1950	290				
4	120	50	400			1525	690	299	100	4.8	13.8
5	270	54	400			1805	1450	770	40		
6						2165	2410	1310	60		
7	295	47	400	134	5.6	3710	2695	960	60		
8	290	69	420	142	4.5	5470	3630	2200	40		
9	205	67	440			3540	3900	1068	40		
10	170	58	420			3130	2435		40		
11	100	72	420			3145	2770	702	180		
12						3560	1710	1941	40		
13						2150	1290	1551	20		
14	55	64	420			2400	1000				
15	36	46	440			1220	1020	936	20		
16				143	4.4	1040	1010	444	60		

indications of an early return of the concentrating power of the kidneys. First, the urine urea concentration was about 50 to 60 per cent of normal by the fifth day and was 80 to 100 per cent of normal by the eighth day. Consequently during the diuresis, large bulks of urea were excreted via the urine (Fig. 2). Second, the urine specific gravity was at normal levels between the sixth to the ninth day. Third, there was a low salt output during the diuresis. On the twelfth day the urea clearance was 70 per cent of normal. The arterial blood pressure was 160/70 on the fourth and sixth days. Between the eleventh and fourteenth days it ranged near 150/90. It then dropped to 130/80 and 120/70 between the eighteenth and twenty-first days. This patient recovered satisfactorily and was progressing nicely 4 months later.

This patient received 500 cubic centimeters of incompatible blood and had an evident severe reaction after all of the blood had been taken. Renal insufficiency with hypertension developed. The hypertension persisted for over 2 weeks. The patient was maintained at near normal hydration and diuresis with recovery occurred in the expected time.

By criteria mentioned by other workers one would have to consider this case as a very severe one. We do not find ourselves in agreement with this view however. It is believed that the early recovery of adequate renal function (early diuresis, concentration power and salt conservation) indicates a less extensive type of damage. One wonders if the absence of prolonged hypotension in association with the reaction was not a factor in early recovery.

CASE 3. (Dr. D. P. Paulson.) A white male, aged 61 years, had a resection of the esophagus for carcinoma of the middle third. The stomach was brought up through the diaphragm and a high anastomosis was made with the esophagus. The operation lasted 7½ hours. Anesthesia consisted of ether, nitrous oxide, cyclopropane and oxygen. During the operation 3000 cubic centimeters of blood, 150 cubic centimeters of 3x concentrated plasma and 1000 cubic centimeters of 5 per cent glucose were given. On 4 occasions during the operation the blood pressure was significantly lowered and the pulse pressure was narrowed (70/50 to 90/75). The sum of these periods of hypotension amounted to 80 minutes during the operation. Immediately after the operation was completed the blood pressure was 110/70 millimeters mercury but within 3 hours it became 96/65. After 500 cubic centimeters of blood and 1000 cubic centimeters of glucose solution the blood pressure became normal. On the second day the patient was found to show signs of dehydration with hemoconcentration and mental cloudiness. After 2000 cubic centimeters of glucose solution there was apparent improvement.

It soon became evident that renal insufficiency was prominent (see Table III). Oliguria, azotemia, lowered blood chloride, serum sodium and plasma bicarbonate concentrations developed. The blood pressure became 140/80 millimeters mercury.

The management of this case was very similar to that of Case 2. The blood loss during the operation

TABLE IV.—URINALYSES, CASES 1, 2, 3

Case	Day	Sp. gr.	Reaction	Albumen mgm. %	Sugar	Acetone	RBC	WBC	Casts
1	4	1.005	Acid	200	–	–	+++	++	++++
	13	1.005	Neut.	–	–	–	–	+	–
	20	1.008	Neut.	Tr.	–	–	–	+	–
2	2	1.011	Acid	++	–	–	++	+	++
	6	1.017	Alk.	+++	–	–	+	++	++++
	12	1.008	Alk.	–	–	–	–	–	–
3	2		Acid	100	–	–	–	+	++
	6	1.010	Neut.	40	–	–	–	–	–
	17	1.012	Alk.	10	–	–	–	–	–

was replaced to such an extent (3500 c.c.) that only a slight anemia developed subsequently. During the period of oliguria, attempts were made to maintain a fluid intake equal to the estimated insensible water loss plus an amount equal to the urine volume. This attempt was not completely successful. Between the second and eleventh days the patient received an average of 851 cubic centimeters of water per day over and above the volume replacing the urinary volume. At the same time a soft diet and a proprietary high caloric-low salt diet were given. Since the environmental temperature was high (summer season) it was obvious that the insensible loss was not completely replaced and that a moderate water deficit developed. This water deficit was of an insufficient proportion to deter the phase of diuresis which occurred in a very similar manner to that of Case 2.

Between the fourth and eighth days 20 grams of sodium bicarbonate were given orally to check the acidotic tendency. Daily vitamin supplements (B complex and C) were administered.

The peak of the diuresis occurred on the ninth day and following this there was a marked recession of the azotemia (Fig. 1). The urine urea concentration and urine specific gravity returned to near normal levels early. As in Case 2 there was a marked urine urea output during diuresis, associated with a low salt excretion (Fig. 2). Thus, during and following diuresis it became necessary to replace water mainly as the salt loss was not great. Recovery from the renal insufficiency occurred. One month later the patient was continuing to do well from the renal standpoint.

The clinical manifestations and course of this case were very similar to those of Case 2. The acute renal insufficiency, however, seemed to result mostly from a prolonged operation with an additive prolonged interval of hypotension. In this case as in Case 2 there was an early return of the concentrating power of the kidney and in association with this feature during the diuresis there was a very bulky urea excretion with a low salt output (Fig. 2). The peak of the diuresis also occurred earlier than in Case 1. It was again demonstrated that the diuresis can develop despite a moderate water deficit.

DISCUSSION

The state of acute renal insufficiency which has been designated as "the anoxic kidney," "lower nephron nephrosis" and "hemoglobinuric nephrosis" has been attended by a high mortality rate. Commonly encountered complications have been generalized edema, mental aberrations, and acidosis. These complications most often have been related to attempts to increase the urinary output during the oliguric period by an excessive intake of water or water and salts. The expected high mortality rate in this group of cases has been markedly lowered by altering the therapeutic approach. Under this proposed management even very severe cases have responded satisfactorily.

The modified management consists of positive measures and has as its basis a combination of morphologic and clinical features. Morphologically it is well established that tubular degeneration with or without focal necrosis of the distal segments is evident early. Tubular recovery and regeneration are definite between the eighth and twelfth days. By the twenty-first day morphologic recovery is well advanced. Clinically the cases can be divided into three phases and the management is additionally based on changes occurring during these phases.

The hypotension of the first phase is most often related to oliguria of blood loss type.

Blood transfusions, therefore, are usually the measure of choice at this time. Assurance of complete compatibility of the blood is naturally imperative. Coombs' test (3, 9) applied to the donor's cells after the proper contact with the recipient's serum serves as an additional check on the compatibility in the immunologically more complex cases. Blood transfusions are also desirable subsequently should prominent grades of anemia develop. During the second phase (renal insufficiency) three major steps have been taken. (1) A near normal state of hydration has been maintained by a water intake equal to the urinary volume plus the estimated insensible water loss (800–2000+, depending on environment, existence of fever, etc.). (2) The tendency toward acidosis has been checked by the periodic administration of sodium bicarbonate (usually orally). The plasma bicarbonate concentration has been maintained at least at the lower limits of normal (carbon dioxide combining power of 50 volumes per cent or higher) and about 4 grams of sodium bicarbonate per day as indicated have been used. (3) Complete starvation has been prevented by giving a dietary formula of approximately one calorie per cubic centimeter as the fluid intake during the early oliguric period. Soft and general hospital diets have been encouraged as early as possible. Vitamin B complex and vitamin C have been given daily. During the third phase (diuresis) not only has there been an attempt to replace the excessive water lost via the urine but estimates have continued to include insensible water loss and checks on the urinary salt output have been conducted. In more severe cases the urinary salt output has been quite high. Frequently 4 to 6 days after the peak of the diuresis and synchronous with abatement of the azotemia, the patient has been able to handle his own fluid-salt intake.

It is generally considered that all cases displaying definite manifestations of prominent renal insufficiency are of severe type. There is reason to believe that varying degrees of severity occur within this entire group, although a superficial resemblance between most cases is the rule. Thus, Cases 2 and 3 were quite similar, and as matters developed, were of much less severity than Case 1. Yet Case 2 received five times as much incompatible blood as Case 1, and Case 3 received no incompatible blood at all. Factors which have indicated greater severity included the following: (1) some period of total anuria or marked and prolonged oliguria (Case 1); (2) a persistently depressed urine specific gravity; (3) a persistently lowered urine urea concentration (as 5–25 per cent of normal); (4) a diuresis that developed later and was more copious (peak at 12–14 days, daily volume 5,000–10,000 c.c.); (5) a prominent salt output during the diuresis; and (6) a residual depression of renal clearance after abatement of the azotemia necessitating continued polyuria. It has been our experience that the level of azotemia or arterial blood pressure are not good indications of severity. The azotemic concentration is not only influenced by renal clearance but also by the dietary intake and the state of extracellular hydration. Thus, Case 1 was starved early because of the gastric lesion and had a distinctly lower blood urea concentration than did Cases 2 and 3. Also, Case 2 had a higher blood pressure than either Case 1 or 3. Although ordinarily the blood pressure level has receded to normal or near normal levels with recovery of renal function, at times hypertension has persisted beyond the period of hospitalization (20–30 days).

Disregard for the main features of the above described management may be the source of grave complications. The hypotension of the first phase may lead to other fatal complications despite renal recovery, as severe brain damage. Failure of sufficient blood replacement may be followed by a severe anemia. During the phase of renal insufficiency the kidneys cannot excrete adequate amounts of water and salt. An excessive intake of these substances at this time results only in an overload within the body which may initiate grave complications. A failure to replace the insensible loss for 5 to 8 days during oliguria may interfere with the onset of diuresis or may cause grave dehydration when diuresis occurs. The azotemia and altered electrolyte pattern of the plasma fluid apparently serve as adequate stimuli for renal function once recovery has progressed to a sufficient extent. Provided a near normal state of hydration has been

maintained, it appears that one can afford to wait and allow renal excretion to be the guide in the daily appraisal of the progress of the case. The prevention of severe acidosis may be attained by administering moderate doses of sodium bicarbonate. With the latter the serum sodium concentration is not necessarily rapidly elevated even when a slight extracellular water deficit exists. As emphasized by Maegraith (16) an excess of sodium bicarbonate is to be avoided. It is also of interest that a daily intake of 0.5 to 1 gram of potassium during the renal insufficiency phase in our experience has not been followed by hyperpotassemia even when a slight water deficit existed. These findings concerning the serum potassium concentration are not unusual and conform with certain observations made by Keith and others.

Failure to replace water and salts adequately during the diuresis may be associated with complications. Dehydration, shock-like state, mental aberrations, convulsions may result.

Each phase in the course of this condition seems to be attended by its own therapeutic implications and its own potential complications. Thus deficits and overloads of various fluid compartments may develop under various therapeutic approaches. The mechanisms involved in alterations of various fluid compartments have been well elaborated by Moyer.

As a result of complications related to management relatively milder forms of this condition may be made severe in appearance or even fatal. Thus, attempts to force water or water and salts early in Cases 2 and 3 could have resulted in disastrous sequelae but with the outlined management these cases responded rapidly and satisfactorily.

SUMMARY

The high mortality rate of certain types of acute renal insufficiency may be substantially lowered by altering the therapeutic approach. Three closely observed cases have been presented to lend additional support to this thesis.

The proposed management consists of positive measures based on renal morphologic changes and the main features of the clinical course. There are three main phases, each of which requires its own therapeutic measures. The hypotension of the first phase is best managed with completely compatible blood. During the second phase (renal insufficiency) a near normal state of hydration is maintained and complete starvation and definite acidosis are prevented as much as possible. During the third phase (diuresis) not only is the water loss replaced but as much as possible a gram-for-gram salt replacement is made.

The regimen is based on the premise that damaged kidneys require time for healing. Evidences of healing, structural and functional, appear between the eighth and twelfth days. Survival of properly managed cases through this interval is apparently greatly influenced by the daily betterment of renal function.

Attempts to stimulate the kidneys to produce urine during the oliguric period usually fail. An excessive intake of water or salts over that immediately lost causes an overload of various fluid compartments and upsets existing osmolar concentrations. It is believed that much of the mental aberrations observed early can be attributed to these complications.

The condition is associated with varying grades of severity. Criteria which have been helpful in ascertaining the relative severity have been discussed. That relatively milder cases may be made fatal if not properly managed seems evident.

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THE INTRAMURAL EXTENSION OF CARCINOMA OF THE DESCENDING COLON, SIGMOID, AND RECTOSIGMOID

A Pathologic Study

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THE present-day approach to the cure of carcinoma of the colon is surgical extirpation of the primary lesion and all its extensions with restoration of continuity of the bowel and preservation of sphincteric control whenever feasible.

The importance of carcinoma of the colon is attested by its incidence and cause of death in the general population. The mortality statistics of the Bureau of Census for 1936 give the total death rate from all causes as 1,151.8 per 100,000 population (22). Of these deaths, cancer and other malignant tumors cause 111 per 100,000. Of the deaths due to cancer, cancer of the intestines except the duodenum, rectum, and anus accounted for 12 per 100,000 population. Since less than 3 per cent of carcinomas of the intestines originate in the small bowel, the figure for cancer of the intestines represents essentially that for carcinoma of the colon, exclusive of the rectum and anus.

Goforth stated that approximately 10 per cent of all carcinomas in the human body and about 96 per cent of all intestinal carcinomas occur in the large intestine and rectum. Azeman, Maydl, Muehler and Nothnagel, in a series of almost 70,000 necropsies, found that 5,796 deaths had been due to carcinoma in general. Almost one-fourth were in the intestinal tract. Rankin, Bargen, and Buie quoted Judd's figures on the location of the cancer in the large bowel. There were 159 (25 per cent) in the cecum and ascending colon; 29 (4 per cent) at the hepatic flexure; 75 (10 per cent) in the transverse colon; 24 (3 per cent) at the splenic flexure; 46 (6 per cent) in the descending colon; and 292 (46 per cent) in the sigmoid. Karsner and Clark, in an analysis of 104 cases of carcinoma of the large intestine, found 28 per cent of the lesions in the right portion of the colon, 10.7 per cent in the transverse colon, 16.7 per cent in the descending colon, and 44.4 per cent in the sigmoid. Lockhart-Mummery listed the locations of 560 carcinomas of the colon which were essentially the same as those given by Judd: appendix, 0.7 per cent; cecum and ascending colon, 22.5 per cent; hepatic flexure, transverse colon, and splenic flexure together, 21.6 per cent; descending colon, 5.3 per cent; and sigmoid, 49.8 per cent (19). It can be seen that nearly 50 per cent of carcinomas of the colon occur on the left side. These figures do not include the rectum which ranks second to the stomach in incidence of carcinoma in the entire gastrointestinal tract.

The purpose of this work was to determine by a pathologic study the extension of any given carcinoma in the long axis of the bowel wall. The study is limited to lesions occurring in the descending colon, including the splenic flexure, sigmoid, and rectosigmoid.

Surgeons dealing with carcinoma of the large intestine have always removed a considerable portion of apparently normal bowel on either side of the carcinoma in order to be sure to include all the extensions of the tumor in the bowel wall. In certain situations, especially in the rectosigmoid, it is technically difficult to accomplish wide excision of apparently normal bowel below the lesion and still restore the normal continuity of the bowel. If the surgeon could resect the bowel closer to the primary lesions without leaving malignant tissue behind, operations in which continuity of the bowel is restored, such as anterior resection, would be feasible in a larger number of cases. With this in mind, this study was undertaken to determine the microscopic extension of the carcinoma in the long axis of the bowel.

Abridgment of thesis submitted by Dr. Black to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Surgery.

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Little attention has been paid to the intramural extension of carcinoma of the bowel in its long axis since 1914. Clogg in 1904 studied 25 cases and reported no intramural spread. Cole in 1913 studied 20 cases in which he took longitudinal strips of bowel including the tumor and examined sections microscopically. There was doubtful extension of one colloid carcinoma 14 inches (35.6 cm.) from the lesion; however, in spite of this, he concluded that the typical intramural spread was wedge shaped with the apex, the lesion itself, and the base, the serosa. The extension was slight but equal above and below the lesion. Cheatle, in 1914, in a similar study of his own cases, reported no longitudinal spread of carcinoma. Monsarrat and Williams, in a study of rectal carcinoma, found evidence of longitudinal spread 2¼ inches (5.7 cm.) from the lesion in 1 case, but for the most part the distance of spread was less than 1 inch (2.5 cm.). He also noted that infiltration was widest in the plane of the longitudinal muscle coat. Miles (16) noted that spread of cancer in the submucosa extended no more "than a few lines" from the mucosal growth and that the spread in the deeper layers was just as limited. Lockhart-Mummery observed that spread of carcinoma by infiltration through the rectal wall was characteristically greater in the submucosa than in the mucosa, and this is borne out by our study. Dukes (9) stated that the opinion as to spread by direct continuity based on gross examination will not be altered much by the microscopic examination.

Several classifications based on the intramural and extramural spread of carcinoma of the rectum have been devised. The best known is that of Dukes (9). He classified the carcinomas into three groups: in group A, he placed those growths which are limited to the wall of the rectum; in group B, those which have extended into the extrarectal tissues but have not metastasized to the regional lymph nodes, and in group C, those which have metastasized to the regional lymph nodes (13). Simpson and Mayo classified carcinoma of the rectum according to the depth of penetration through the bowel wall: group A included those lesions which are limited to the mucosa; group B, those lesions which penetrate to the submucosa, and group C, those lesions which penetrate to the serosa. Such classifications are useful in determining the prognosis. In cases of lesions in group A, the prognosis is best and in group C, the worst.

METHODS OF SPREAD OF CARCINOMA

Although the original work in this paper deals only with the spread of carcinoma in the bowel wall, a brief review of all methods of spread is indicated.

Carcinoma of the colon spreads in 3 ways: (1) by local extension from its origin, (2) by invasion of the venous system, and (3) by means of the lymphatics.

Local extension. Most carcinomas of the colon are slow growing. They take their origin from altered mucosal cells deep in the crypts of Lieberkuehn. Welch thought that mucosal spread is by contact and that some stimulus from the cancer cell, be it chemical, virus, or other, acts on the cells adjacent. The spread through the layers of the bowel wall is by infiltration. The muscle is penetrated by rootlike projections between the bundles of muscles. Lockhart-Mummery and Dukes (8) stated that ulceration usually begins when the muscular layer is reached due to interference with the blood supply at the surface and local sepsis.

Venous spread. Invasion of the venous channels may occur at any stage in the development of the carcinoma. When this occurs the formation of malignant thrombi and dispersion of malignant emboli make complete removal of the carcinoma impossible. The lesion most commonly spreads through the portal system to the liver. The work of Batson on the function of the vertebral veins with their anastomoses with the portal system explains the occasional occurrence of metastatic lesions in bone, especially the sacrum, coccyx, and lumbar vertebrae. Studies by Coller, Kay, and MacIntyre, Seefeld and Bargen, and Dukes and Bussey have shown that intravascular invasion occurs in 15 to 20 per cent of malignant lesions of the colon. Seefeld and Bargen showed that the incidence of venous invasion increased as the grade of malignancy (Broders' method) and the extent of mural penetration increased. Visceral metastasis is not always present when

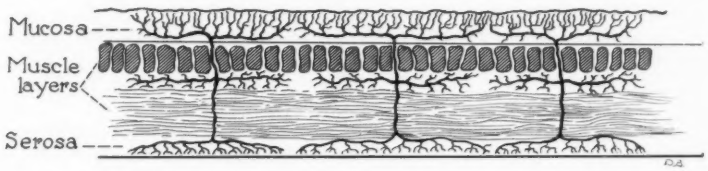

Fig. 1. Intramural lymphatic system of the colon. Graphic presentation of Cole's description.

evidence of venous involvement is found. Dukes and Bussey were unable to find other metastatic involvement at necropsy in 10 of 13 cases in which the veins were invaded.

Lymphatic system. The importance of spread of carcinoma in all parts of the body through the lymphatic system has long been recognized. All operations employed for extirpation of malignant growths in the colon are designed to include removal of the lymphatics that drain the region of involvement. The lymphatic system of the colon can be divided into the extramural (serosa to regional lymph nodes) and intramural (mucosa to serosa) components.

The anatomy of the extramural lymphatics was best described by Delamere, Poirier, and Cunéo. The lymphatics of the iliopelvic portion of the colon at first traverse some small glands which are attached to the terminal branches given off by the paraintestinal arch and formed by the anastomosis of the three sigmoid arteries. They then terminate in glands placed over the inferior mesenteric artery. The lymphatic vessels of the descending colon present an arrangement similar to that of those in the iliopelvic portion of the colon. In other words, the extramural lymphatics of the left portion of the colon are situated along the arteries to that region. Recent work by Glover and Waugh has shown that the spread of carcinoma of the rectum and rectosigmoid through these lymphatics is upward in 99 per cent of the cases.

The anatomy of the intramural lymphatics was best described by Cole (Fig. 1). The lymphatics of the mucosa do not exist as a continuous plexus but are arranged as decussating branches from the collecting stems which pierce the circular muscular coat. The intermuscular lymphatics are similarly limited. Small branches situated between the muscle coats drain into collecting stems which empty into subserous plexuses. From here the drainage is to the paracolic lymph glands which are a part of the extramural lymphatic system.

STUDY OF 103 SPECIMENS

Materials and method. The materials used in this study were 103 specimens of bowel removed at operation at the Mayo Clinic. A few criteria were used in their selection: the lesion had to be in the descending colon, including

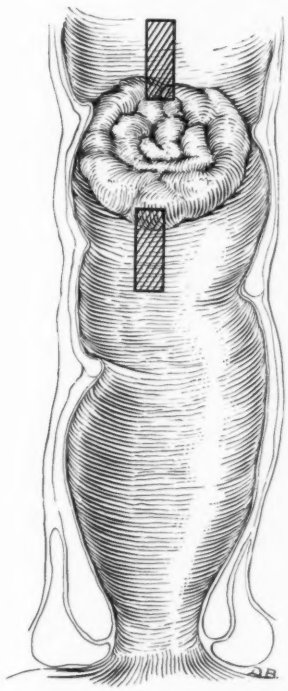

Fig. 2. Position of blocks removed from specimens.

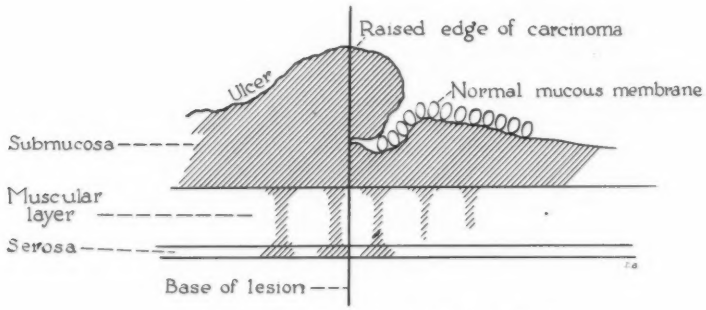

Fig. 3. The edge or base point of the lesion.

the splenic flexure, the sigmoid, or rectosigmoid and at least 1 inch (2.5 cm.) of grossly normal bowel had to be present above and below the carcinoma. Specimens were selected so that lesions of all four grades of malignancy (Broders' method) were included in the study.

Each specimen was subjected to the following examination: blocks of tissue through the entire bowel wall were removed above and below the lesion in such a manner that the edge of the tumor was included with the normal bowel (Fig. 2); frozen and paraffin sections of blocks were made; all sections were stained in the usual manner with hematoxylin and eosin and subjected to careful microscopic examination.

The examination of the slides was carried out in the following manner: the edge or base point of the lesion was marked on the slides; the limit of extension of the carcinoma was marked on the slide and the distance from the base point was measured in millimeters; the greatest depth of penetration through the bowel wall was noted; the layer of the bowel wall in which the farthest extension had occurred was noted, and finally the malignancy of the tumors was graded according to the method of Broders.

The edge or base point of the lesion is illustrated in Figure 3. It was felt that the cauliflower or overlying free edge of the tumor was movable and therefore inconstant on palpation so that it should not be used for measurement. Consequently, the base of this free edge was chosen as the base point of the lesion.

The carcinoma was followed out to the point of greatest extension from the lesion (Fig. 4). This point was marked on the slide and the distance between the two points was measured in millimeters. The layer in which maximal extension had occurred was noted as well as the layer of deepest penetration through the bowel wall.

All tumors were graded independently by the author and then checked with the grade reported by the pathologist at the time of removal. This grading corresponded well with the reported grades, and in those instances in which a difference occurred, these specimens were checked by Dr. John R. McDonald of the section on surgical pathology of the clinic. Table I shows the grades of the carcinomas

TABLE I.—THE MICROSCOPIC GRADE (BRODERS) OF MALIGNANCY OF LESIONS AND THEIR LOCATION IN THE COLON

Grade	Rectosigmoid	Sigmoid	Descending colon	Total
1	5	10	15	30
2	8	14	19	41
3	3	7	9	19
4	1	5	7	13

TABLE II.—INVOLVEMENT OF LYMPH NODES IN EACH LOCATION

Location	Specimens	Involvement of lymph nodes	
		Cases	Per cent
Descending colon	50	22	44.0
Sigmoid	36	16	44.4
Rectosigmoid	17	10	58.8
Total	103	48	46.6

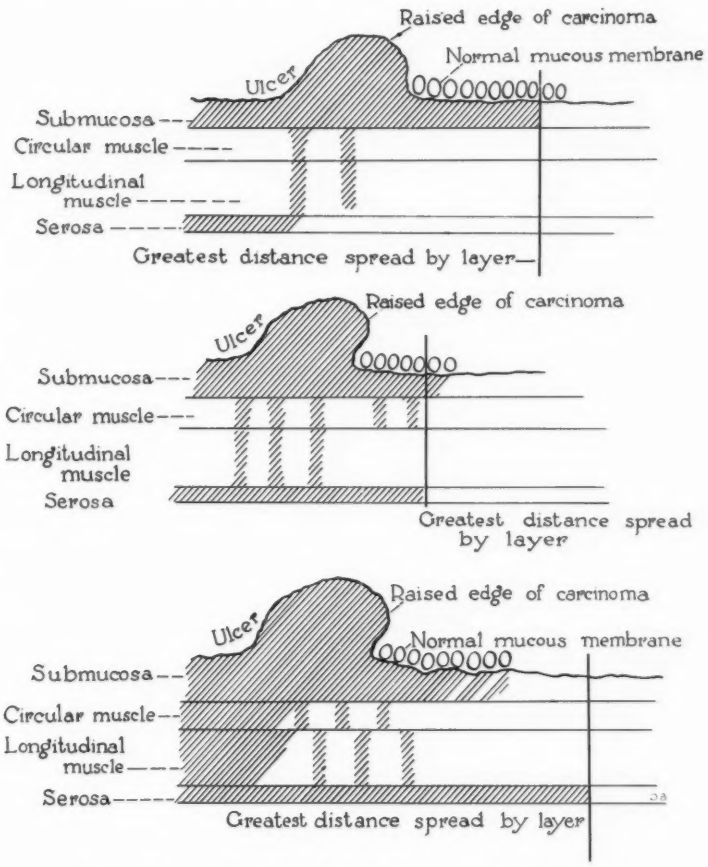

Fig. 4. Manner of extension of carcinoma in wall of the large bowel.

studied and the location of the lesion in the bowel.

Information was available regarding the presence or absence of involvement of lymph nodes from the pathologic reports on the fresh specimens. This information was accepted without further study of the specimen. Table II shows the percentage of cases in which lymph nodes were involved for each location. These figures are probably low since all the nodes in each specimen removed were not examined microscopically. This information is presented only to show that the short distance of intramural spread which was found cannot be explained on the basis of early lesions or the low-grade invasive power of the tumors studied.

Results. The results of this study are best discussed under the following headings: (1) extension by plane of the bowel wall, (2) depth of penetration through the bowel wall, and (3) relation of involvement of lymph nodes to depth of penetration.

Extension by plane of the bowel wall.—The spread of carcinoma in the mucosa ended abruptly and was marked by the raised edge of the lesion. Figure 5 illustrates this phenomenon. In this photomicrograph, the normal mucosa can be seen extending up the raised edge of the carcinoma even though a clump of malignant cells lies directly beneath.

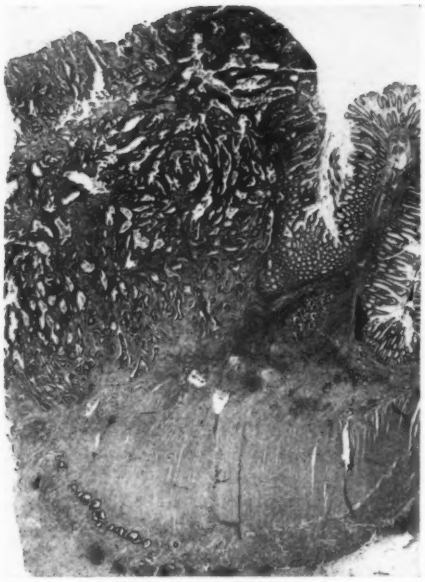

Fig. 5. Carcinoma, grade 1, showing mucosal and submucosal spread. ×7.5.

Spread in the submucosa was characterized by large masses of carcinoma cells pushing the muscular layers away from the mucosa and increasing the thickness of the bowel wall in the region of the gross lesion. Extension longitudinally under the mucosa was characterized by small islands of carcinoma cells infiltrating the loose submucosal tissues to varying distances and usually surrounded by aggregates of lymphoid cells. The thickness of the bowel wall was not increased. In Figure 5, a small island of carcinoma cells is seen under the villus just to the right of the raised edge of the lesion. The upper diagram in Figure 4 illustrates the submucosal spread under normal mucous membrane. The shaded areas represent carcinomatous infiltration. Note that though the longitudinal spread is greatest in the submucosa, the carcinoma has infiltrated to the serosa. Maximal extension occurred in this layer in 50 per cent of all the specimens examined.

The spread through the muscular layer was characterized by incomplete columns of carcinoma cells radiating down between the muscle bundles. This suggests that the spread follows the paths of the intermuscular lymphatics. Figure 6 illustrates the extension of a grade 1 adenocarcinoma through the muscular layers. Maximal extension occurred in these layers in 26 per cent of all the specimens examined. The middle diagram in Figure 4 illustrates the usual spread of carcinoma through the muscular layers.

TABLE III.—LAYER OF BOWEL WALL IN WHICH GREATEST SPREAD OCCURRED

Layer of bowel wall	Descending colon		Sigmoid		Rectosigmoid	
	Specimens		Specimens		Specimens	
	Number	Per cent	Number	Per cent	Number	Per cent
Submucosa	24	48	18	50.0	9	52.9
Circular muscle	8	16	4	11.1	4	23.5
Longitudinal muscle	7	14	1	2.8	2	11.8
Serosa	11	22	13	36.1	2	11.8

In the serosa, extension was characterized by small dispersed groups of carcinoma cells situated usually in the subserous layer and surrounded by clumps of lymphoid cells. Figure 7 shows a group of grade 4 carcinoma cells in the subserous layer. The lower diagram in Figure 4 illustrates, by the shaded areas, the typical spread when the greatest longitudinal extension occurs in the serosal layer. Maximal extension occurred in this layer in 24 per cent of all the specimens.

In Table III are summarized the findings concerning the plane of the bowel wall in which maximal extension occurred for each of the locations in the colon from which specimens were examined. The percentage occurrence in each location is recorded.

No appreciable difference was noted in extension above or below the lesion. The greatest longitudinal extension in any specimen was 12 millimeters and in only 4 of the total number of specimens was the spread 5 millimeters

TABLE IV.—EXTENSION OF CARCINOMA

Location	Minimal	Maximal	Average
	Millimeters		
Descending colon	less than 1	12	2.42
Sigmoid	less than 1	4	1.90
Rectosigmoid	less than 1	3	1.35

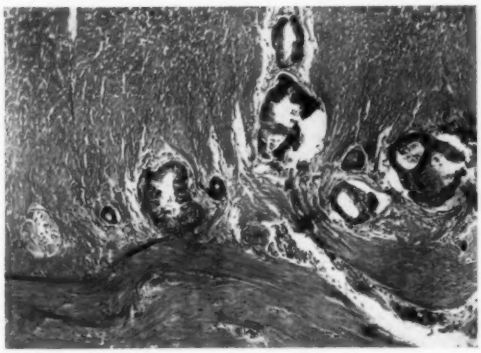

Fig. 6. Carcinoma, grade 1, infiltrating the muscular layers of colon.

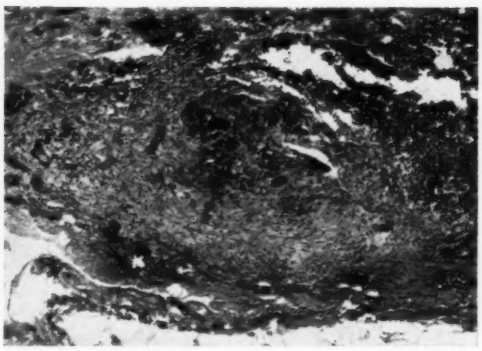

Fig. 7. Carcinoma, grade 4, infiltrating in subserous layer of colon.

or more. All of these were located in the descending colon. This would indicate that greater extension occurs in this location in the bowel. In Table IV the minimal, maximal, and average distance of spread of carcinoma for the three locations studied are listed.

The grade of carcinoma had no relation to the intramural spread. Of all the grade 4 carcinomas studied, only one, or 7.6 per cent, had extended more than 5 millimeters. The lesion which had spread a distance of 12 millimeters was a grade 1 adenocarcinoma.

Depth of penetration.—The depth of penetration through the bowel wall had no relation to the longitudinal spread. The serosa was involved in 37 per cent of all the specimens examined. In all these specimens, the greatest longitudinal extension occurred in a layer nearer the mucosa. These findings vary with the contention of Miles (16) that intramural spread is wedge shaped with the apex at the mucosa. In Table V are summarized the findings concerning the plane of deepest penetration through the bowel wall for each location in the colon and the percentage occurrence for the different locations.

TABLE V.—LAYER OF DEEPEST PENETRATION OF BOWEL WALL

Layer of bowel wall	Descending colon		Sigmoid		Rectosigmoid	
	Specimens		Specimens		Specimens	
	Number	Per cent	Number	Per cent	Number	Per cent
Submucosa	13	26	13	36.1	3	17.6
Circular muscle	7	14	6	16.7	6	35.3
Longitudinal muscle	8	16	1	2.8	4	23.5
Serosa	22	44	16	44.4	4	23.5

Relation of involvement of lymph nodes to depth of penetration.—Lymph nodes are involved before the carcinoma penetrates through the bowel wall. Of the 48 specimens in which lymph nodes were involved, the depth of penetration through the bowel wall in 24, or 50 per cent, of the specimens was not to the serosa. These findings support the contention of Miles (16,17) that metastasis to the lymph nodes occurs before the bowel wall is penetrated and are at variance with Dukes' (9) assumption that lymph nodes are not involved until the bowel wall is penetrated.

CONCLUSIONS

1. In carcinoma of the colon, the raised edge of the lesion may not mark the limit of intramural extension.

2. There is no appreciable difference in intramural spread of carcinoma above or below the lesion.

3. Intramural spread of carcinoma is greater in the descending colon than in other sites in the left portion of the colon.

4. The plane of greatest extension in the bowel wall is the submucosa.

5. The grade of malignancy (Broders' method) of the lesion has no relation to the degree of intramural spread.

6. Spread of carcinoma through the bowel wall appears to follow the course of the intramural lymphatics.

7. Spread of carcinoma to the extramural lymphatics occurs before the entire bowel wall is penetrated.

8. For resections of the left part of the colon for carcinoma, only 2 centimeters of normal bowel need be allowed above and below the lesion in order to remove the whole of the primary lesion.

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STUDIES ON VAGOTOMY IN THE TREATMENT OF PEPTIC ULCER

IV. Changes in Gastric Motility and the Effect of Drugs on Motility Following Complete Vagotomy

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THE history of vagotomy and its use in the treatment of peptic ulcer have been recently reviewed (15, 18). It is likely that all of the procedures used in man by the early workers in this field resulted in only partial vagus section. Dragstedt's introduction of complete vagotomy as a treatment for peptic ulcer in 1943 (2) has caused renewed interest in the subject.

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Dr. Stein is Abbott Fellow in Surgery, Northwestern University Medical School.

In June of 1946 a clinical and physiological study of vagotomy in the treatment of peptic ulcer was started on one of the surgical services at the Cook County Hospital (K.A.M.). During the following year, vagus section was carried out in 35 cases of peptic ulcer in which definite indications for surgery were present.

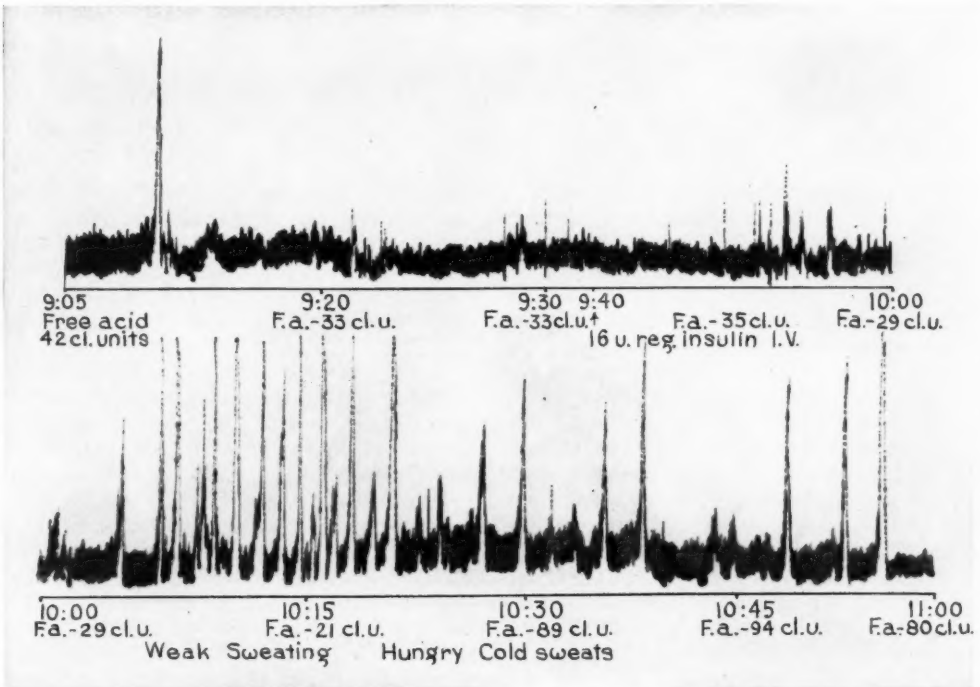

Fig. 1. Gastric motility tracing before vagotomy showing spontaneous and insulin induced hunger contractions.

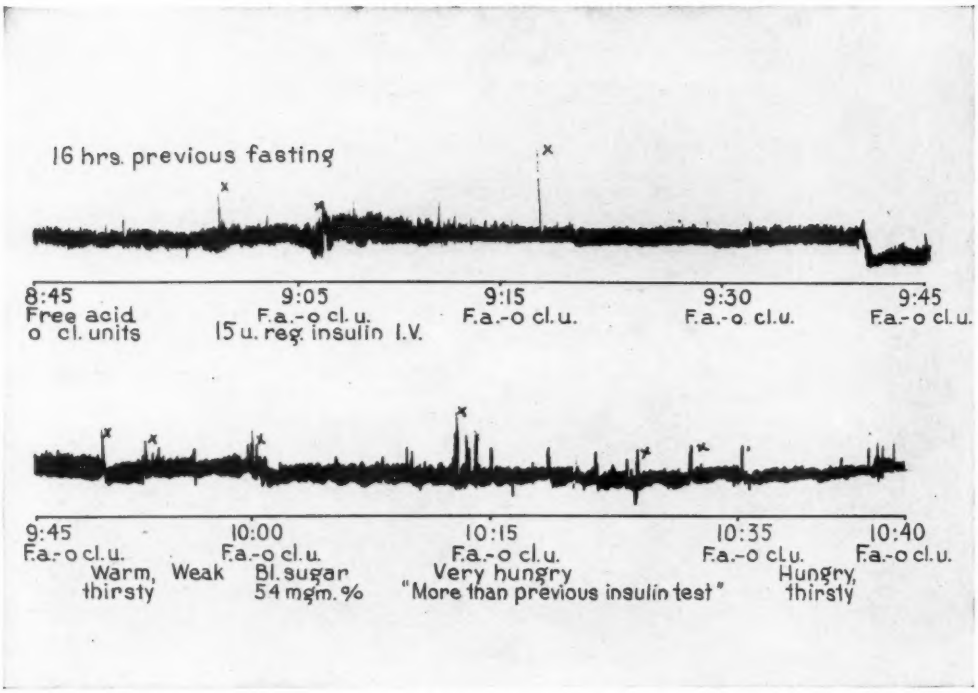

Fig. 2. Gastric motility tracing following complete vagotomy showing no spontaneous or insulin induced hunger contractions.

These patients were thoroughly studied, both before and after surgery. A clinical evaluation of this series (9) and results of the physiological studies (19) are published elsewhere. The present report is concerned primarily with the changes in gastric motility and the effects of drugs on gastric motility following complete vagotomy.

Early in our series, 1 of the patients developed an acute gastric retention and dilatation on the 10th postoperative day. This complication aroused our interest in the use of drugs to stimulate gastric emptying after vagotomy.

The therapeutic use of choline esters has been previously studied. The subject has been reviewed by Starr and Ferguson and Goodman and Gilman (5). Youmans demonstrated experimentally the stimulatory effect of urecholine on intestinal motility. Recently, Machella, Smith, Grimson and Dragstedt (3) have reported on the use of urecholine in the treatment of gastric retention following vagotomy. We have previously confirmed this use of urecholine and have reported a similar action of doryl (20). Postlethwait has compared the action of neostigmine, mecholyl, doryl, and urecholine on the intestine of the rabbit.

METHOD

The motility of the stomach was determined after 16 to 24 hours of fasting by passing a tube into the stomach with a 200 cubic centimeter balloon attached. The balloon was placed high in the fundus of the stomach and its position verified by inflation and gentle withdrawal until a slight tug was felt as the balloon reached the cardiac end of the stomach. The balloon was then partially inflated with 10 to 50 cubic centimeters of air and connected to a water manometer. Recordings were made on a slowly moving kymograph. An average of 10 hours of tracings was made on each of 27 patients.

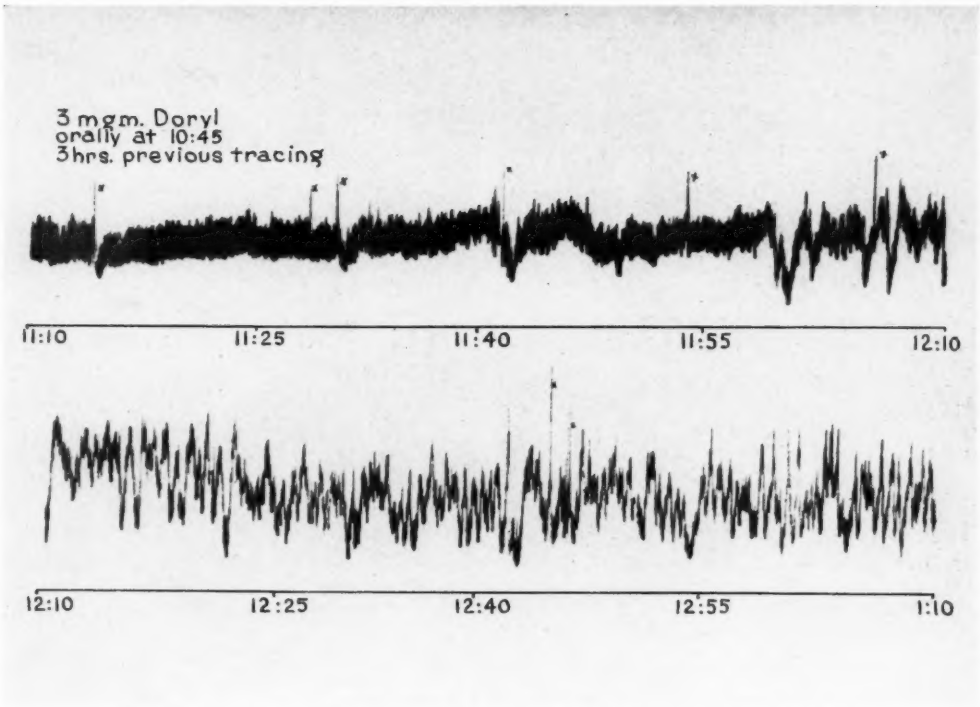

Fig. 3. Postoperative motility tracing showing the effect of 3.0 milligrams of doryl by mouth.

After the spontaneous fasting motility had been determined for 1 to 3 hours, the effect of the following drugs was noted: insulin, doryl, urecholine, prostigmine, and mecholyl. In most instances only 1 drug was tested per day in order that a possible synergistic effect would not confuse the results.

RESULTS

Before vagotomy all 27 patients showed spontaneous type I and occasionally type II and III hunger contractions (1) (Fig. 1). Following complete vagotomy, as determined by the insulin test, 24 patients had no spontaneous hunger contractions in the fundus of the stomach after 16 to 24 hours of fasting. Tonus rhythm was noted, but no hunger contractions were present (Fig. 2). The patients were studied 10 days to 2 weeks after surgery. Seven of 8 patients studied 3 to 9 months later had no spontaneous hunger contractions. An insulin test in the eighth case showed return of vagus function after 9 months. Spontaneous hunger contractions were present in the fundus of the stomach.

After incomplete vagotomy, as determined by the insulin test, spontaneous type I or type II hunger contractions were noted in 2 of 3 cases.

Effect of insulin. Before vagotomy insulin hypoglycemia was usually followed by a period of hypermotility (Fig. 1). After complete vagotomy, in 24 cases there were no hunger contractions in the fundus of the stomach following insulin hypoglycemia (Fig. 2). After incomplete vagus section in each of 3 cases, insulin hypoglycemia was followed by hunger contractions.

A detailed discussion of the effect of insulin hypoglycemia on the stomach and its use in this study as a test after vagotomy has been reported (18).

Fig. 4. Barium meal 10 weeks after vagotomy had been carried out.

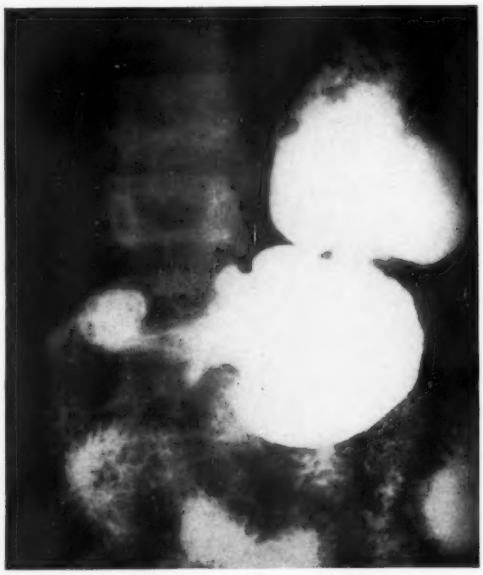

Fig. 5. Same as Figure 4, 5 minutes after the administration of 0.25 milligram of doryl subcutaneously.

TABLE I.—THE EFFECT OF DRUGS ON GASTRIC MOTILITY AFTER COMPLETE VAGOTOMY

Drug	Dose Milligrams	No. of trials	Results			
			No effect	Increased motility		
				Slight	Moderate	Marked
Carbamylcholine (doryl)	0.25 subcut.	10			2	8
	2–4 orally	9	2		2	5
	2 sublingually	1 (20)		1		
Urethane of B-methylcholine (urecholine)	5 subcut.	3				3
	10 orally	8		3	2	3
	10 sublingually	1 (12)		1		
Doryl and urecholine	2 plus 10 orally	3				3
Prostigmine	0.25 i. m.	2	2			
	0.5 i. m.	2	2			
	15 orally	1	1			
	30 orally	4	4			
	45 orally	2 (11)	1			1
Mecholyl	200 orally plus	2	2			
	200 orally	1	1			

The effects of doryl, urecholine, prostigmine, and mecholyl on gastric motility after complete vagotomy are summarized in Table I.

Effect of doryl (carbamylcholine). The administration of doryl, 2 to 4 milligrams orally (Fig. 3) or 0.25 milligram subcutaneously (Figs. 4, 5), was usually followed by a marked increase in gastric motility.

Following oral administration, the increased motility was noted from ½ hour to 1½ hours later, and lasted from 30 minutes to 3 or more hours. Following subcutaneous injection, the increased motility was noted in 5 to 10 minutes and lasted 30 minutes to 1 hour. There were no serious toxic effects although occasionally sweating, salivation, or abdominal cramps were noted. Two tests were terminated when 2.0 milligrams of doryl given orally produced no change in gastric motility in 1 hour. It was later determined that the stimulatory effect may not be noted for 1½ hours. This may have been the case in these tests, listed in Table I as "No effect."

Effect of urecholine (urethane of B-methylcholine). The administration of 5.0 milligrams of urecholine subcutaneously was followed by

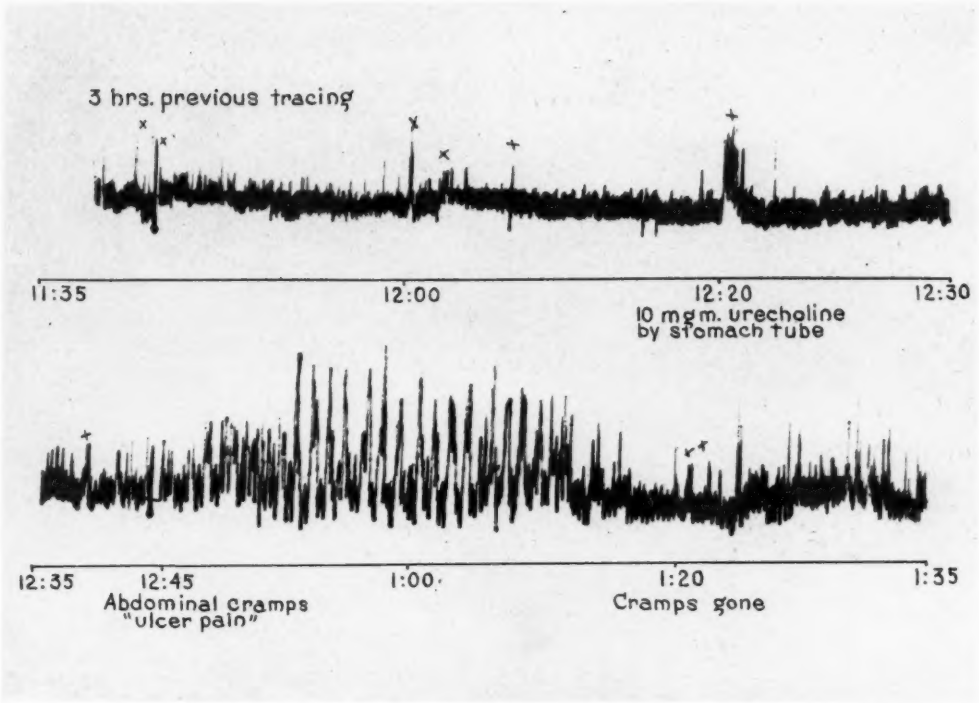

Fig. 6. Postoperative motility tracing showing the effect of 10.0 milligrams of urecholine by mouth.

increased gastric motility in 10 minutes, lasting 30 minutes to 1 hour. Ten milligrams by mouth usually produced increased gastric motility in 30 minutes to 1½ hours, lasting 30 minutes to 3 or more hours (Fig. 6). There were no serious toxic effects, although a few instances of sweating or abdominal cramps were noted.

Combined effect of doryl and urecholine. Two milligrams of doryl were given by mouth and 45 minutes to 1 hour later 10.0 milligrams of urecholine were given orally. A marked increase in gastric motility was noted soon after the urecholine was given, lasting at least 3 hours (Fig. 7). There were no serious toxic effects.

Effect of prostigmine. In only 1 instance of 11 trials did prostigmine produce any change in the gastric motility. In this case 45.0 milligrams by mouth produced a marked increase in motility associated with severe abdominal cramps. The intravenous injection of 0.6 milligram of atropine sulfate caused immediate cessation of both the cramps and increased gastric motility.

Effect of mecholyl. In 2 instances, 200.0 milligrams of mecholyl by mouth produced no change in gastric motility. A second dose of 200 milligrams was given once at the end of 1 hour, without effect.

X-ray studies. A detailed report of these studies is to be published elsewhere (17). In general, 2 weeks after complete vagotomy there was a marked delay in gastric emptying with a 50 to 70 per cent retention of barium in 4 hours.

A gastroenterostomy was performed on 25 of the patients. In 8 instances it was done as part of previous surgical procedures in patients who later developed marginal ulcers. Gastric retention was present in patients with and without gastroenterostomy, but was greater in the latter group. Delay in emptying was less

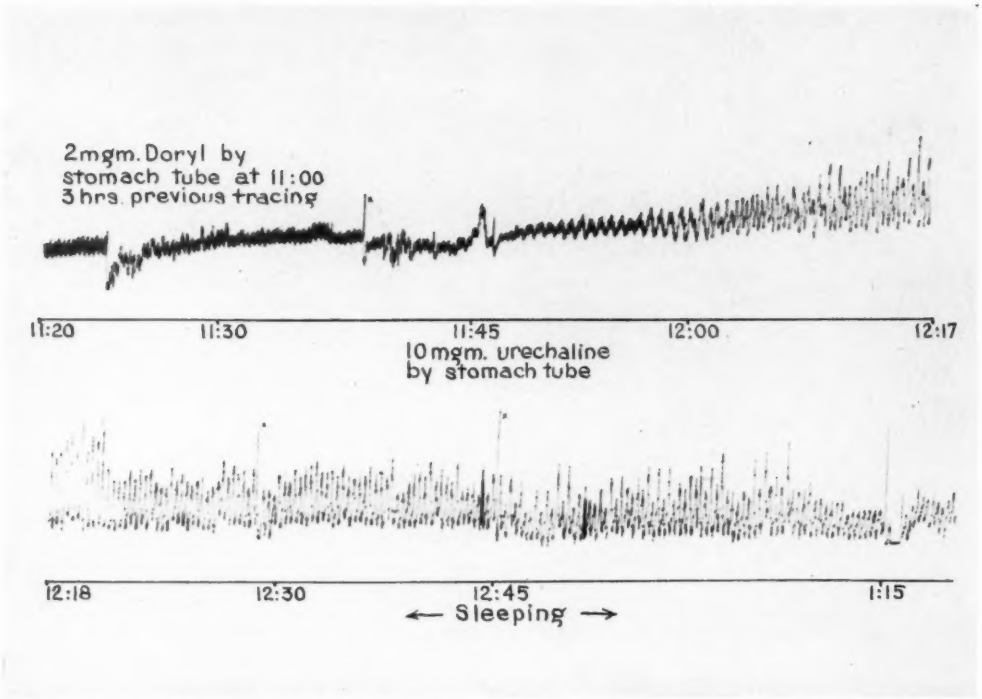

Fig. 7. Postoperative motility tracing showing the combined effect of 2.0 milligrams of doryl and 10.0 milligrams of urecholine by mouth.

marked after 3 months; however, after 9 months, delayed emptying was still present.

DISCUSSION

Following complete vagus section, there is a marked reduction of gastric motility and a prolongation of gastric emptying time. Early in this study, oral feedings were started on the third or fourth postoperative day, but following the case of gastric retention and dilatation mentioned earlier, the regimen was changed to prevent any early distention of the stomach. Postoperatively continuous intragastric suction and parenteral fluids were maintained for 5 days. On the 6th and 7th days small feedings of clear liquids were given and on the 8th and 9th days small feedings of a general liquid diet were given. A soft diet was usually allowed on the 10th day. Since the postoperative care was changed, delayed gastric emptying was still noted, but was less marked. In only a few patients did symptoms of gastric distention require the therapeutic use of doryl or urecholine, and no further cases of acute retention and dilatation were encountered. When used therapeutically, either 2.0 to 4.0 milligrams of doryl or 10.0 milligrams of urecholine were given by mouth three times a day before meals. Parenteral administration, either 0.25 milligram of doryl or 5.0 milligrams of urecholine subcutaneously, was sometimes used first.

Additional treatment was unnecessary after a few days to a week. The patient who had acute gastric retention and dilatation previously mentioned was an exception and required more prolonged therapy. This patient had partial gastric retention after 24 hours and complained of foul belching. Treatment with doryl or urecholine was continued for 5 months after which time the patient was asymptomatic, although gastric emptying was still markedly delayed.

We have observed that both doryl and urecholine cause an increase in gastric acidity as well as an increase in motility. This stimulatory effect on gastric secretion of doryl has been previously noted by Noll and Goodman (4) and of urecholine by Machella. Recurrence of ulcer symptoms has not been noted in patients receiving these drugs either experimentally or therapeutically.

The pharmacological action of doryl and urecholine has been studied and reviewed by Starr and Ferguson. They conclude that, although the therapeutic usefulness of the two drugs is similar, doryl has a much stronger nicotine-like action than urecholine and is therefore more toxic.

Following complete vagus section, doryl or urecholine produces gastric motility simulating normal type I or type II hunger contractions, as well as increase in gastric tone. These hunger contractions differ from normal spontaneous hunger contractions in that they are more frequent and more regular, but are of smaller amplitude.

SUMMARY AND CONCLUSIONS

The gastric motility of 27 patients with peptic ulcer has been studied before and after vagus section. By the method of motility study described, it has been shown that no spontaneous or insulin induced type I, II, or III hunger contractions are present in the fundus of the stomach up to 9 months after complete vagotomy. There is a marked delay in gastric emptying following complete vagotomy. Delayed emptying is still present after 9 months. After incomplete vagus section, hunger contractions are present either spontaneously or following insulin hypoglycemia.

Doryl, 0.25 milligram subcutaneously, or urecholine, 5.0 milligrams subcutaneously, produces a rapid but transitory increase in gastric tone and motility following complete vagotomy. The oral administration of doryl, 2.0 to 4.0 milligrams, or urecholine, 10.0 milligrams, usually produces a more sustained increase in gastric tone and motility after complete vagus section. Prostigmine and mecholyl have little if any effect on gastric motility after complete vagotomy.

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INTRAPERITONEAL PRESSURE IN THE HUMAN

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INTRAPERITONEAL pressure is one of the stresses thrown on a healing abdominal incision. This work was undertaken to measure intraperitoneal pressure and to determine the effect of such factors as position, movement, coughing, straining, and early ambulation.

In the literature there has been considerable controversy concerning intra-abdominal pressure in humans. Emerson reviewed the literature in 1911 and found that a number of investigators reported a negative pressure and an equal number reported a positive pressure. From the rather scant details of this paper it seems that those reporting positive pressure had introduced balloons into the body orifices and those reporting negative pressures had introduced needles or trochars into the peritoneal cavity. Overholt and Lam pointed out that in a peritoneal cavity containing no free gas or fluid, only a negative pressure will be registered when a needle or trochar is introduced as nothing enters the needle or trochar.

Overholt in 1931, Lam in 1939, and Rushmer in 1946 studied the abdominal pressure in animals using balloons introduced into the peritoneal cavity and agreed that intraperitoneal pressure is hydrostatic and depends on the position of the animal and on the vertical level at which pressure is measured.

It seemed to us that intraperitoneal pressure in humans could be accurately measured by balloons introduced into the peritoneal cavity and that these could be introduced and left without harm at the end of such abdominal operations as those requiring drains and in those for penetrating abdominal wounds. No harm has occurred to any patient so studied.

METHODS

A rubber condom was cut off at its open end so as to hold 60 to 100 cubic centimeters of air without resistance and was tied over the end of a urethral catheter. The catheter was brought out through a stab wound, and in the earlier experiments the balloon was placed free in the peritoneal cavity. It was found that the balloon gravitated to the pelvis, so in the later experiments the position of the balloon was fixed by a suture passed through the abdominal wall, around the catheter near the balloon and tied outside. In some cases two balloons were introduced, one in the upper abdomen and one in the lower. The position of all balloons was checked by roentgenograms.

Pressure was measured by a U manometer containing water or bromoform. The latter is a heavy fluid and was used in recording the higher pressures. All pressures are reported in centimeters of water. To measure the intraperitoneal pressure, the balloon was first inflated with air to its full capacity of 60 to 100 cubic centimeters. It was then completely emptied and 5 cubic centimeters injected at a time and the pressure recorded. It was usually found that any volume between 5 and 25 cubic centimeters could be injected without varying the pressure more than 1 centimeter of water. In all cases an amount was injected so that 5 to 10 cubic centimeters more or less caused a change of pressure less than 1 centimeter of water.

In some cases the pressure was read off the manometer, in others kymograph tracings were made.

RESULTS

With the subject supine, the intraperitoneal pressure was found to average 8 centimeter of water in 9 patients with 30 separate recordings and there was no difference in pressure in the upper and lower abdomen (Fig. 1). With the subject erect, the pressure in the upper abdomen was found to remain about the same. In the lower abdomen the pressure increased almost 3 times its supine value (Fig. 2). In one subject in which the upper balloon was located just beneath the dome of the left dia-

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Presented in the Forum on Fundamental Surgical Problems before the Clinical Congress of the American College of Surgeons, New York, September 8-12, 1947.

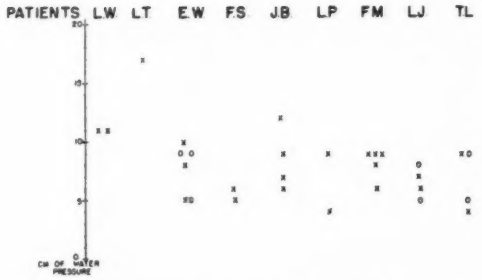

Fig. 1. Intraperitoneal pressure with patient at rest in supine position. *x*, Lower abdomen; *o*, upper abdomen. Average pressure: upper abdomen, 8 centimeters of water; lower abdomen, 7.5 centimeters of water.

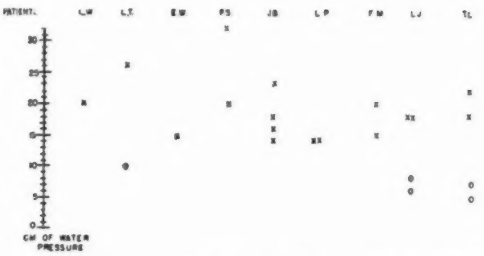

Fig. 2. Intraperitoneal pressure with patient at rest in erect position. *x*, Lower abdomen; *o*, upper abdomen. Average pressure: upper abdomen, 7 centimeters of water; lower abdomen. 19 centimeters of water.

phragm, the pressure actually dropped a little (Fig. 3).

In comparing pressures taken at two different vertical levels by using two balloons in the same peritoneal cavity, it was found that the greater the distance between the vertical levels, the greater the difference in pressure (Fig. 4). The relationship is closer than shown as the distances were simply measured off as shown on an x-ray film taken at 36 inches, which magnified the distance. This confirms the findings of Lam, Overholt, and Rushmer who, from data in animals, concluded that intraperitoneal pressure was a hydrostatic one.

EFFECT OF EFFORT

The most marked increases were due to coughing and vomiting. One patient (J.P.) with a hard cough blew the fluid out of a manometer with a limit of 150 centimeters. This was partly overshoot, but since another patient (C.J.) maintained a pressure of 80 centimeters while retching, we feel that the 150 was not unreasonable (Table I).

Table I shows the average actual pressures attained and the average increases over supine pressures in various activities. The pressure attained in getting out of bed (29 cm.) and

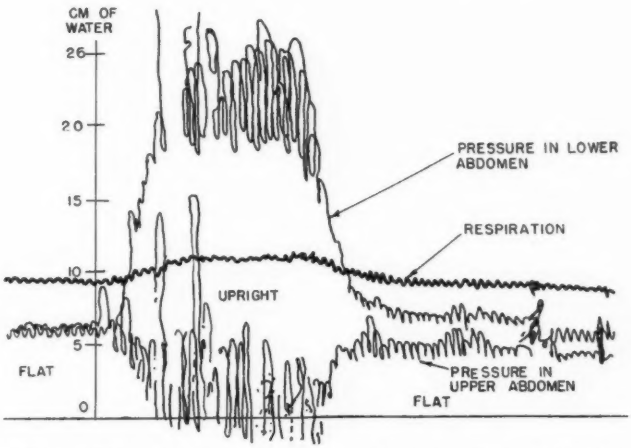

Fig. 3. Effect of posture on intraperitoneal pressure. Upper balloon just beneath left diaphragm. Change of position on electrically driven tilt table. T.L. Fourth day after operation.

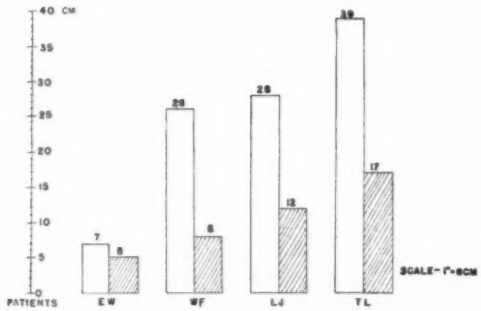

Fig. 4. Difference in pressure at different vertical levels with patient in the erect position. White space, distance between upper and lower balloons. Crosshatched space, difference in pressure (cm. of water) in upper and lower balloons. E.W., upper balloon just below superior spine of ilium; W.F., upper balloon at level of twelfth thoracic vertebra; L.J., upper balloon at level of eleventh thoracic vertebra; T.L. upper balloon at level of fifth intercostal space.

TABLE I.—EFFECT OF EFFORT ON INTRAPERITONEAL PRESSURE

(Cm. Water)

	Average		
	Actual pressure	Increase over supine pressure	No. patients
Semi-Fowler position	10	4	3
Full Fowler position	16	8	4
Arising from bed to standing	29	20	6
Walking	18	11	3
Sitting in chair	17	8	6
Getting into bed	26	12	1
Getting on bedpan	19	0	3
Voiding while on bedpan	13	3	3
Defecation while on commode	34	23	1
Straining at stool while on commode	41	33	3
Coughing	62	53	6
Vomiting	80	72	1

walking (18 cm.) does not approach the pressure increase in such unavoidable activities as vomiting (80 cm.) and coughing (62 cm.) when supine. The highest single pressure recording, as was mentioned before, was 150 centimeters attained on coughing.

The intensity of effort in such a voluntary act as straining at stool can be controlled by the patient, and it is probable that he can partly control the intensity of such acts as getting out of bed. A patient with little pain is more likely to strain and cough hard and to move abruptly. These factors affect the intraperitoneal pressure. However, it is seen in Table I that on an average the acts of straining at stool, getting on bed pans, and defecating cause about the same increase as getting out of bed and walking.

It must be remembered, however, that intraperitoneal pressure is only one of the stresses thrown on an abdominal wound, the other most important one being muscle pull. It is

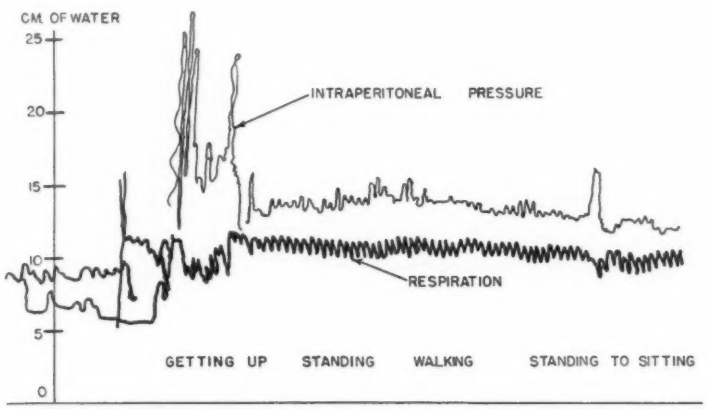

Fig. 5. Effect of effort and posture on intraperitoneal pressure. Balloon located just to left of umbilicus. J.P. Third day after operation.

likely that the abdominal muscles can be strongly contracted without greatly increasing the intraperitoneal pressure. However, from the above data we can say that the increase of intraperitoneal pressure due to walking and rising does not throw a significant stress on the healing wound.

EFFECT OF ABDOMINAL DISTENTION

It is difficult to assess abdominal distention. In the 1 patient (W.F.) whose abdomen was definitely but not severely distended, the supine intraperitoneal pressure was 21 centimeters. It seems reasonable to assume that a large amount of intestinal gas would increase the intraperitoneal pressure.

EFFECT OF RESPIRATION

In general there were fluctuations of pressure of 2 to 4 centimeters with respiration. In 2 patients in which the pressure was read from the manometer the intraperitoneal pressure decreased on inspiration. On all those in which kymograph tracings were made and simultaneous ordinants obtained, the pressure rose on inspiration. It is suggested that the type of fluctuation depends on the predominance of the type of respiration, i.e. diaphragmatic or intercostal. Overholt found this to be true in animals.

EFFECT OF PNEUMOPERITONEUM

We do not believe that the amount of air introduced into the peritoneal cavity at the time of operation was significant in our work. In measurements taken over a period of a week there was no progressive decrease in pressure as the air was absorbed.

Further, it was found that when 40 to 70 cubic centimeters of air was injected into one of two balloons in a peritoneal cavity the pressure in the other balloon did not change. More air was not injected because of the production of pain. This same experiment was carried out in 2 patients.

CONCLUSIONS

1. A safe, accurate method of measuring intraperitoneal pressure in humans is presented.
2. Intraperitoneal pressure has been studied in the human during the first postoperative week.
3. In the supine position the intraperitoneal pressure is about 8 centimeters of water in both the upper and lower abdomen.
4. In the erect position the pressure in the upper abdomen is about 8 centimeters of water. The pressure in the lower abdomen is about 20 centimeters of water. The greater the vertical distance between the two points measured, the greater is the difference in pressure.
5. Involuntary action such as coughing, vomiting and straining at stool, elevates the pressure to levels as high as 80 centimeters of water, which is a much greater elevation than that caused by arising and walking.
6. Early ambulation does not increase the intraperitoneal pressure enough to make it a significant stress on the abdominal incision.

NOTE.—Our interest in intraperitoneal pressure was stimulated not only by the apparent advantages of early ambulation but also by a personal experience in 1942 following a right inguinal herniorrhaphy. My own experience with early ambulation at the time demonstrated that patients had much less pain in the incision when attempting to void in the erect position or defecate on the toilet than when attempting to perform either of these functions in the supine position in bed. The pain in the incision was quite obviously due to contraction of the abdominal muscles in an attempt to increase intra-abdominal pressure and it was apparent that, in the erect position, patients had much less tension on the incision than when lying flat in bed. This impression has, I believe, been confirmed by Dr. Drye's experiments. R. Arnold Griswold.

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EDITORIALS

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THE SURGICAL SIGNIFICANCE OF INDETERMINATE PULMONARY LESIONS

THE development of curative surgical treatment for lesions within the chest has been almost entirely accomplished within the past three decades. Prior to that time intrathoracic surgery consisted chiefly of the drainage of infections. The diagnosis of lesions within the thorax began somewhat earlier and was enhanced by the discovery of the x-ray by Roentgen in 1895 and the use of the bronchoscope by Killian in 1897. These diagnostic aids for a time set the pace for therapy. In recent years, however, adequate anesthesia, blood and other parenteral fluid therapy, chemotherapy, and the development and improvement in surgical technique have advanced surgical management to a very high degree. This stage of development was forecast by Adler in 1912 when he wrote, "There is every reason to hope that the technique of this new branch of surgery will be still further developed and that in the near future thoracotomy and operations on the lungs will be attended by no more risk than peritoneal operations today . . . When all the means of diagnosis outlined in this little study fail, where there are suspicions of tumor but no assurance is possible, there should be—it is emphatically here stated—as little hesitation in resorting to an exploratory thoracotomy as there is now in submitting to an exploratory laparotomy." That the risk of exploring the thorax is now very little when the fundamental principles are observed is most fortunate, since in spite of many improvements in diagnostic methods there still remains a considerable proportion of inflammatory, neoplastic, and congenital intrathoracic lesions which defy all attempts at diagnosis.

In the earlier course of the development of this field of surgery, when the operative approach was made with considerable hesitation and risk, diagnosis depended to a considerable extent on the clinical history and findings. Refinements in x-ray diagnosis awaited further development, and recognition of the lesion was not forthcoming until an advanced stage had been reached. Unfortunately, all too frequently this delay necessitated a much more radical type of surgery, if indeed more than an exploratory thoracotomy could be performed.

Although the clinical history and findings continue to play an important part in diagnosis, they frequently fall far short of an adequate means on which to base proper surgical management. Roentgenograms and bronchograms when properly employed are perhaps our best means of identifying intrapulmonary lesions. When these are combined with bronchoscopic observation and biopsy, pneumothorax and bronchial secretion examination,

the true nature of the lesion may be found in a high percentage of cases. The difficulties of diagnosis in the early and uncomplicated stage of the lesion have increased in number in recent years with the routine roentgenologic or fluoroscopic examination of the chest of employees of many industrial, educational, and other institutions. At this early stage no symptoms have been experienced and the physical examination reveals no apparent abnormality. The responsibility of deciding at that time as to proper therapy is much greater because frequently all means of diagnosis fail to determine the nature of the lesion. Further, it is at this early date that proper therapy should be instituted since in the case of malignancy the prognosis for a long time cure is quite good. All too frequently, however, the lesion is viewed as insignificant since it has given rise to no symptoms. The physician, as well as the patient, is given a false sense of security by the fact that symptoms and altered physical findings are absent.

What are some of the more common lesions which present this problem of diagnosis and early therapeusis? One of the more common conditions in which a delay in diagnosis is of prime importance is primary carcinoma of the lung. Approximately from 25 per cent to 35 per cent of these lesions arise in the periphery of the lung, away from the main bronchi. At an early stage they appear as a circumscribed opacity and produce no symptoms. Their rate of growth is variable but many may be present for a number of months or even years before their presence is manifested. When found on fluoroscopic or x-ray examination, these lesions are frequently mistaken for tuberculosis. This error is made especially because of the slow rate of growth of the lesion and the appearance at times of small cavities within the opaque area. In spite of the fact that the sputum, if present, remains negative for tubercle bacilli, the diagnosis of tuberculosis may be entertained for a long period of time.

Peripheral tumors frequently undergo central necrosis with cavity formation. Infection follows and leads to the production of signs and symptoms of a lung abscess. At one time it was thought that these peripheral lesions carried a poor prognosis. This conclusion was based on the fact that the lesion was far advanced when symptoms first developed and the condition was first recognized. It is now known that, if the tumor can be identified before symptoms have been produced, the prognosis for a long time cure following extirpation is very good. When it is appreciated that almost one-third of primary lung cancers arise in the peripheral region, the importance of early exploration after a reasonable period of study to rule out other conditions will improve the outlook for this lesion in a high percentage of cases. It has been our experience at the University of Chicago Clinics that the peripheral group of primary lung cancer when diagnosed and explored at an early date has a much better chance for a long time cure than have those tumors arising in the main stem bronchi. Examination of the bronchial secretions will give positive results in some cases. The lack of facilities for using this method of diagnosis should never delay the prompt institution of proper surgical therapy. Since exploratory thoracotomy in itself carries very little risk, these patients should receive its benefit rather than have proper treatment delayed until a chance for cure is past.

In other patients primary lung tumors are frequently diagnosed as unresolved pneumonia, virus pneumonia, or pneumonitis. This mistaken diagnosis is particularly apt to be made when the lesion is in the upper lobe and therefore cannot be visualized through a bronchoscope. A study of the bronchial se-

cretions may be indeterminate. If there is no specific evidence to support the diagnosis of unresolved pneumonia or pneumonitis, the likelihood of malignancy should be strongly considered and investigated without delay. At the present time through the use of chemotherapeutics, most pyogenic infections of the lung will respond in a reasonable length of time. Since the risk of lung resection has been reduced to a very reasonable level, this form of treatment should be considered if the diagnosis cannot be otherwise ascertained. The incidence of carcinoma of the lung is so much greater than that of chronic pneumonitis or unresolved pneumonia that the chance of resecting a nonmalignant lesion is unlikely.

During recent years a congenital abnormality of the lung, i.e. cystic malformation, has been more frequently recognized. This condition produces symptoms usually after the involved region has become infected. The clinical picture at times is not unlike that of lung abscess, tuberculosis, or primary lung tumor. In most cases differentiation is possible. However, at times since the lung becomes airless, x-ray examination and other means of diagnosis fail to reveal the true nature of the condition. When these patients are properly prepared for operation by the use of chemotherapeutic agents, blood transfusion, and other replacement therapy, exploration is attended with little risk and the lesion can be dealt with in a satisfactory manner.

Mediastinal tumors, chronic inflammations, and congenital cysts are sometimes difficult to recognize or to differentiate from lesions arising in the lung. Many of these lesions remain entirely asymptomatic until through pressure on adjacent structures, a pulmonary infection is produced or there is interference with the function of the adjacent organs. The clinical features and x-ray findings are virtually the only means on which to base a working diagnosis. If the lesion can be dealt with before complications arise, the problem of satisfactory treatment is not nearly so great and the morbidity is considerably reduced. Mediastinal dermoids, bronchogenic cysts, and congenital abnormalities of the vessels of the mediastinum fall into this group. Mediastinal dermoids are prone to undergo malignant degeneration and thus present an additional indication for exploration and removal at a time when they may seem innocuous due to the fact that no symptoms have been produced.

Much progress has been made in the operative care of intrapulmonary lesions. If the benefit of early exploration in patients with indeterminate lesions is kept in mind, the outlook for pulmonary malignancy will be much improved.

W. E. ADAMS.

PRESENT STATUS OF PULMONARY DECORTICATION

THE present interest in pulmonary decortication is an outgrowth of experience acquired during World War II. Military surgeons, when faced with the problem presented by massive, clotted and organizing pleural accumulations under which lungs were collapsed, accepted the challenge by opening the thorax, removing the pleural content and stripping from the visceral pleura the confining envelope of organized fibrin.

As experience accumulated, there evolved the concept of a lung retained in a state of collapse by peripleural fibrous or fibrinous investments independent of any gross intrapleural mass. The operative procedure itself was amplified to include not only the removal of restraining pleural "peels," but also a complete mobilization of the lung so that it could lie free within the thorax and be unhampered in expansion. Thus, it was capable of completely filling its hemithorax in a very brief period of time.

This present day concept of decortication contrasts with the operative procedure carried out by Delorme, Ransohoff, and others. These pioneers, working in an infected field and without the protection of modern adjuncts to surgery, were forced to keep their dissections from violating uncontaminated pleural recesses. When confronted with persistent intrapleural spaces, therefore, they carried the chest wall to meet the collapsed lung, but by thinning or removing the thick visceral "peel" they utilized what expansibility of lung they could muster in order to lessen the final gap between the lung and chest wall. Whereas these men resorted to decortication late in the course of disease, the modern approach calls for relatively early exhibition of the procedure.

The basic indication for pulmonary decortication lies in a lung that cannot re-expand because it is held in the collapsed position by peripleural investments. Each of the following factors must be considered: (1) the bronchial tree must be patent, so that air can enter the lung freely, (2) the lung itself must be intrinsically capable of expansion, (3) the content of the pleura must be displaceable or removable in order to demonstrate that its mere presence is not maintaining collapse, and finally, (4) there must have existed a pleural process capable of laying down a restraining peripulmonary deposit.

To determine patency of the air passages bronchoscopy is required. Thoracentesis can generally demonstrate the nature of the pleural content as well as its displaceability. The inherent ability of the lung to expand can only be appraised by clinical evaluation, which, needless to say, may involve extensive investigation. Any lung, which fails to expand after removal or effective neutralization of its pleural factor, must be considered as captive on a mechanical basis if its bronchial tree is patent and its intrinsic expansibility is assured.

Considering in more detail the pleural factors, it should be recalled that inaspirable (solid or semisolid) pleural accumulations are usually fibrinous in nature and maintain collapse by their bulky presence, and that the mere removal of this pleural mass is not likely to suffice in promoting pulmonary re-expansion because a perivisceral envelope of organized fibrin is probably present if the process is a week or more old. In the presence of a bronchopleural fistula, adequate neutralization of the pleural factor (air) may not be possible because it is being constantly replaced. Likewise, any pleural process which produces fluid continuously must be looked upon with suspicion because a true retaining cicatricial "peel" is not capable of significant secretory or transudative activity. Although continued production of pleural fluid can occur concomitantly with the deposition of a retaining "peel," it is not likely that under these circumstances the mechanical retention of the lung in the collapsed state will be an important feature of the clinical problem. Pleural neoplastic implants, for example, frequently behave in this manner.

In addition to these basic considerations one additional requirement must be satisfied, namely, that the process responsible for the production of the collapsed and captive lung is controlled or quiescent, or at least that it can be controlled at the time of decortication.

Acute pyogenic empyemas do not generally provide the basic indication for decortication because adequate management of the pleural factor (which must include dependent drainage), usually results in pulmonary re-expansion even though this may occur slowly. The more indolent pleural infections, on the other hand, such as are occasionally seen in pleurae surgically contaminated by staphylococci, may require aggressive treatment because of copious production of heavy fibrinous pleural

fluid which is, of course, inaspirable. Three approaches to this problem seem possible: (1) to allow the septic process to progress temporarily unaltered by treatment, (2) to carry out intensive treatment by antibiotics and chemotherapy, (3) to undertake evacuation of the pleural content, decortication of the lung, and free drainage of the pleura under protection of suitable antibiotics or chemotherapy. The first modality subjects the patient to a period of uncontrolled sepsis. Six or eight weeks may be required before sufficient liquefaction of the fibrin and frank suppuration can occur so that surgical drainage is possible. The second alternative may bring about a clinical remission, but it is very doubtful indeed if sterilization of the pleural mass can be achieved. Neither of these two approaches is acceptable, not only for the reasons mentioned, but also because throughout the entire period of such management, organization of the pleural fibrin is undoubtedly proceeding and either a chronic empyema or severe crippling by fibrothorax is likely to occur under the most favorable circumstances.

In tuberculous pleuropulmonary disease, the applicability of decortication would seem to be extensive when one considers the widespread use of pneumothorax and its possible complications. The limitations, however, are very real indeed. First of all, re-expansion of collapsed lungs in tuberculosis not only requires quiescence of the process that brought about the condition of a captive lung, but also establishment of the fact that the status of the lung itself justifies resumption of its normal volume in accord with the mandates of collapse therapy. Furthermore, the time in the course of the disease at which decortication comes up for consideration is usually late. One must, therefore, take into account the possibility that sufficient scarring in cortical lung may have occurred to be almost as effective a barrier against re-expansion as the peripleural peel itself.

The optimum time for decortication in organizing hemothorax (traumatic) can be rather clearly defined and lies between three and six weeks after onset. In the indolent pyogenic processes referred to above on the basis of limited experience the same time interval seems satisfactory.

The pathogenesis of peripulmonary deposits in tuberculous disease, however, seems variable. It is difficult to differentiate clearly between a more or less transient effusion of relatively innocent nature and an empyema which is controllable by treatment. Prognostication of results of decortication in a disease which is characterized by subtle vagaries and has so deceptive a mien seems problematical. Nevertheless, decortication is being utilized to reclaim the function of lungs that would have in the past been deemed unexpandable. This is certainly a justifiable approach and no doubt will save many lungs, but our understanding of the vagaries of pleural deposits in this disease is probably not adequate to allow selection of suitable candidates unerringly. Experience acquired in the future may clarify these points.

Whatever may be the ultimate rôle of decortication in the management of tuberculous disease, it serves as a ready means of obliterating intrapleural spaces by restoring lung volume, which is the ideal solution in many nontuberculous conditions. Such a potential result in the control of pulmonary re-expansion represents a very long step forward.

HIRAM T. LANGSTON.

THE SURGEON'S LIBRARY

REVIEWS OF NEW BOOKS

THE Swiss obstetricians and gynecologists recently decided to prepare textbooks of obstetrics and gynecology themselves instead of depending upon German and French textbooks. Guggisberg and his associates wrote the textbook of gynecology and the two volumes which constitute the textbook of obstetrics were prepared by Koller[1] with the assistance of nine other Swiss obstetricians who teach and practice in Basel, Zurich, and Geneva. The book was written in German. There will be a third book devoted to operative obstetrics.

There are 1,323 pages in the two volumes and 711 illustrations. Of the 1,261 pages of text (the remaining 62 pages are devoted to the index) 180 pages or exactly one-seventh of both volumes are given over to fetal monstrosities (100 pages) and pathology of the newborn (80 pages). Likewise, 142 of the 711 illustrations, or one-fifth of all the illustrations, pertain to abnormalities of the newborn. The amount of space devoted to the newborn (aside from the chapter on the physiology of the newborn) seems disproportionately great. Many illustrations have been borrowed or copied from other textbooks, but all of them are excellent.

The authors describe and illustrate methods of resuscitating newborn babies, including Schultze's swingings. These procedures are dangerous and should not be used. Likewise there is a detailed description and two illustrations of the Credé method of expressing the placenta, but this manipulation can do great harm and should be forgotten. We have far safer ways of expressing the placenta.

As in the United States, the author (Held) agrees that in cases of pre-eclampsia if improvement does not follow conservative treatment, the uterus should be emptied by induction of labor from below or by cesarean section. However, in cases of eclampsia three forms of therapy are described, namely active, conservative, and "middle line." Koller prefers the "middle line" treatment of eclampsia and advises against cesarean section. Most obstetricians in the United States also favor conservatism for nearly all cases of eclampsia.

In cases of placenta previa, chief reliance is placed upon the transperitoneal cervical cesarean section for the serious cases and rupture of the membranes for the mild cases. The author (Koller) properly cautions against forcible dilatation of the cervix in cases of placenta previa.

The ten authors of this book are to be congratulated on having written an excellent textbook. Naturally the style is not uniform, but all the authors have presented their subjects in simple, lucid language. The advice given is nearly always conservative and in accordance with the practice of leading obstetricians everywhere in the world. The illustrations are well chosen, abundant, and highly instructive. The publishers also are to be commended for the paper is good, the type is clear, and the illustrations have been clearly reproduced. This textbook will undoubtedly be very popular not only in Switzerland, but also in other parts of the world where physicians and students read German.

J. P. GREENHILL.

THE authors of *Nouvelles techniques de traitement des fractures*[2] give a fairly complete review of recent developments in fracture treatment by the use of open and closed methods. The principal theme is their use of Kirschner wires to secure fragments by transverse or intramedullary fixation. They describe their animal experiments to show that Kirschner wire fixation causes little interference with bone healing. They also depict a reducing frame which permits the use of traction in any direction, as well as a number of special wire guides which they have devised.

A preface by their teacher, Prof. J. Leveuf of the University of Paris, states that the authors are the originators of the method of Kirschner wire fixation "with the minimum of surgery." This is in keeping with the ideals of their common mentor, Pierre Delbet, who constantly strove for preservation of function while securing union of the fractures.

Each type of fracture in the body is considered and the latest developments in treatment are described. Some old material is used, such as the various reconstruction operations of the hip and the different types of bone grafts. On the other hand, much attention is paid to the newer methods of intramedullary pin fixation of fractures.

The book is well planned and the illustrations are good, but there are very few bibliographic references to correspond to the names mentioned in the text. While this is a fault, it can be excused, as they say, it was "published in a difficult period" when library facilities were far from adequate.

WALTER G. STUCK.

[1]LEHRBUCH DER GEBURTSHILFE. Vols. 1 and 2. By Th. Koller. Basel, Switzerland: S. Karger, 1948.

[2]NOUVELLES TECHNIQUES DE TRAITEMENT DES FRACTURES. By H. Godard and R. Michel-Bechet. Paris: G. Doin & Cie, 1948.

WHEN Dr. Bick's first book on the history of orthopedic surgery appeared in 1933, I was rather critical because of the many omissions and serious defects as to historical and bibliographic matters. His next source book in 1937, was not only a great improvement as a book, but many of the errors had been corrected and new and valuable material had been added. The present edition of *Source Book of Orthopaedics*[1] marks another substantial advance toward, but does not yet equal, the standard set by Garrison in the several editions of his *History of Medicine* which has been a "light unto our feet" in all of our medical literary efforts for many years. Dr. Bick has, however, repaired even some defects in Garrison's books as far as our orthopedic antecedents are concerned.

Having been an amateur bibliographer for many years, I feel that I am in a position to make a few suggestions for the improvement of the present work. Before doing so, I am most anxious to express my appreciation of the great amount of valuable effort that the author has put into his book in the intervals between the three volumes. The volume as it now stands is not only highly instructive and interesting, but practically indispensable to any real student of past or present orthopedic surgery.

As in many other fields in so called modern science, this book seems to me to neglect fundamentals somewhat, and to overemphasize the recent literature of gadgets and techniques. For the same reason, perhaps, our forefathers in this field are neglected or misunderstood to some extent. To cite one example —William Adams, of the London scene of about a hundred years ago and "a sound fellow" in our orthopedic work of those days, is listed in the index entirely under the name of one of our present day juniors, W. E. Adams of Chicago.

To indicate to other researchers in this field that there is still work to be done, there are Abercrombie, Amesbury, Bampfield, and Ballingall at the beginning of the alphabet in London and Edmund Andrews, E. P. Banning, J. P. Batchelder, and H. H. A. Beach in this country, all of whom played their part but are not to be found in Dr. Bick's list.

American writers on clubfoot prior to 1850, in addition to those mentioned by Bick, included Detmold of New York, James H. Dickson of New York, G. W. Norris of Philadelphia, N. R. Smith of Baltimore, A. G. Walton of Pennsylvania, Thomas J. Garden of Virginia, Heber Chase of Philadelphia, J. B. Brown of Boston, John O'Reilly of New York, H. H. Smith of Philadelphia, L. A. Dugas of Georgia, and J. C. Nott of Alabama. There was an extensive literature of bone and joint surgery, compiled by Henry H. Smith of Philadelphia, including resections, astragalectomies and other procedures often redescribed since, in his "Surgery" of 1863. But the only H. Smith mentioned by Dr. Bick was an associate of Willis Campbell in 1941.

I have recently been much interested in books (and sources) by Balduinus and Bynaeus, two important contributors to the literature in the 17th century. This is of "shoes," a subject of much interest to all orthopedic surgeons, but one which has been rather neglected both in the literature and in practice.

One may infer that a little search in the other portions of the alphabet will turn up many names of those who helped to pave the highway upon which we now travel with so much more comfort than in years gone by. There are many special chapters in our history that may not be developed fully in a work like this, perhaps, but that should be recorded as a matter of interest to all students of the history of surgery; for example, the indebtedness of Jacques Benignus Winslow who is quoted properly as an authority in anatomy to Bidloo, from whom he "borrowed" his fine plates and who is not mentioned at all.

Also, it still rankles a bit, as it did when Dr. Bick published his first volume, that most of the pioneers in the middle west, from the time of the Western Reserve, about which Dudley Allen wrote so well, down to the development of the American Orthopedic Association have been neglected. Edmund Andrews of Michigan and Chicago and David Prince of Illinois did some of the best early writing in the country on orthopedic topics. Louis Bauer, of New York and St. Louis has been quoted with high approval not only by Hugh Owen Thomas but since that time by Sir Arthur Keith. And certainly, Arthur Gillette should have credit not only for his pioneer work in the state care of crippled children but for his papers, for example, on the nailing of fractures of the hip, in which, I believe Chicago and Minneapolis (or St. Paul) led the way, and not New York or Boston.

Any future editions of Dr. Bick's book or any similar work should devote more attention to the special societies and to those men who have been leaders in thought as well as deed in the affairs of our specialty. John Ridlon of Chicago, for example, exerted more of an influence upon teaching and practice than many of those to whom Dr. Bick refers many times in his list of "sources."

In my recommendation of Dr. Bick's book to every reader of orthopedic surgery, I cannot but admit that my attitude is the more friendly because Dr. Bick has taken the pains to straighten out the whole matter of what has been thought by some to be a Trueta-Orr controversy. His account of the origin of my method and the use of it by Trueta is exactly as both Dr. Trueta and I have frequently stated it. There has never been any difference that could not have been resolved by anyone who would take the trouble to read even what Trueta himself has said about it.

So, I shall continue to use this book myself with much pleasure and profit, as I have in the past, and hope that Dr. Bick will keep up the good work.

H. WINNETT ORR.

[1]SOURCE BOOK OF ORTHOPAEDICS. By Edgar M. Bick, M.A., M.D., F.A.C.S. 2nd ed. Baltimore: The Williams & Wilkins Co., 1948.

THE textbook of physiology, *Human Physiology*,[1] edited for medical students by two teachers at University College, London, is an astonishingly complete treatment of the subject in 564 pages of material. Chapters have been contributed by Pickering, Mackay, Gregory, Smyth, Young, Newton, P. Eggleton, Whitteridge, Feldberg, Lythgoe, Rawdon-Smith, and M. G. Eggleton; nevertheless the multiple authorship is less evident than is the case for most compendia, as the editors have succeeded admirably in achieving a homogeneity of style. It is probably inevitable that some chapters are superior to others in the extent and clarity of the exposition, but there is no segment of the vast field of physiology that is neglected. One of the techniques utilized in achieving comprehensiveness with minimal verbiage is the intrusion of definitions, etc. as parenthetic material. The following examples are illustrative: "a reduction of the alkali reserve (acidosis)"; "red cells may clump together (agglutinate)"; "nictitating membrane (a third eyelid present in some species)." To attain economy of space there is little or no bibliographic material, but there is a surprisingly great amount of illustrative material in the form of figures, diagrams, and charts. Many of these are excellent, but a few (time-worn heritages of earlier texts) could be dispensed with without penalizing the quality of the book.

In general, the book is not directed toward being an "applied physiology" in the sense that it is primarily devoted to the exposition of clinical phenomena, but in the opinion of the reviewer this is an asset rather than a liability. Clinical applications (where important) are dealt with, but there is no evasion of the material for which, as yet, the clinical counterparts are missing. It is a praiseworthy addition to the library of this field. CARL DRAGSTEDT.

[1] HUMAN PHYSIOLOGY. By F. R. Winton, M.D., D.Sc., and L. E. Bayliss, Ph.D. 3rd ed. Philadelphia, Toronto: The Blakiston Co., 1948.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

GENERAL ENDOCRINOLOGY. By C. Donnell Turner, Ph.D. Philadelphia and London: W. B. Saunders Co., 1948.

RECENT ADVANCES IN SURGERY. By Harold C. Edwards, C.B.E., M.S., F.R.C.S. 3rd ed. Philadelphia: The Blakiston Co., 1948.

MEDICAL WRITING; THE TECHNIC AND THE ART. By Morris Fishbein, M.D. 2nd ed. Philadelphia and Toronto: The Blakiston Co., 1948.

MODERN TRENDS IN DIAGNOSTIC RADIOLOGY. Edited by J. W. McLaren, M.A., M.R.C.S., L.R.C.P., D.M.R.E. New York and London: Paul B. Hoeber, Inc., 1948.

ORAL SURGERY. By Kurt H. Thoma, D.M.D. Vols. 1 and 2. St. Louis: The C. V. Mosby Co., 1948.

TEXTBOOK OF SURGICAL TREATMENT: INCLUDING OPERATIVE SURGERY. Edited by C. F. W. Illingworth. 3rd ed. Baltimore: The Williams and Wilkins Co., 1947.

BREAST FEEDING. By F. Charlotte Naish. London, New York, and Toronto: Geoffrey Cumberlege, Oxford University Press, 1948.

RECENT ADVANCES IN ANÆSTHESIA AND ANALGESIA. By C. Langton Hewer. 6th ed. Philadelphia and Toronto: The Blakiston Co., 1948.

RECENT ADVANCES IN OBSTETRICS AND GYNÆCOLOGY. By Aleck W. Bourne and Leslie H. Williams. 7th ed. Philadelphia and Toronto: The Blakiston Co., 1948.

SUCCESSFUL MARRIAGE. Edited by Morris Fishbein, M.D., and Ernest W. Burgess, Ph.D. Garden City: Doubleday and Co., Inc., 1948.

PREOPERATIVE AND POSTOPERATIVE CARE OF SURGICAL PATIENTS. By Hugh C. Ilgenfritz, A.B., M.D., F.A.C.S. St. Louis: The C. V. Mosby Co., 1948.

A MANUAL OF PRACTICAL OBSTETRICS. By O'Donel Browne, M.B., M.A.O., M.A., LITT.D., F.R.C.P.I., F.R.C.O.G. 2nd ed. Baltimore: The Williams and Wilkins Co., 1948.

THE SURGERY OF THE COLON AND RECTUM. By Sir Hugh Devine and John Devine. Baltimore: The Williams and Wilkins Co., 1948.

STANDARDS FOR THE DIAGNOSIS AND TREATMENT OF CANCER. By the Cancer Committee of the Iowa State Medical Society. Iowa City: Athens Press, 1948.

ANATOMY OF THE HUMAN BODY. By Henry Gray, F.R.S. 25th ed. Edited by Charles Mayo Goss, M.D. Philadelphia: Lea & Febiger, 1948.

ZINSSER'S TEXTBOOK OF BACTERIOLOGY. Revised by David T. Smith, M.D., Donald S. Martin, M.D., M.P.H., Norman F. Conant, Ph.D., Joseph W. Beard, M.D., Grant Taylor, M.D., Henry I. Kohn, Ph.D., M.D., and Mary A. Poston, M.A. 9th ed. New York: Appleton-Century-Crofts, Inc., 1948.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

ARTHUR W. ALLEN, Boston, *President*
DALLAS B. PHEMISTER, Chicago, *President-Elect*

PRELIMINARY PROGRAM FOR 1948 CLINICAL CONGRESS THE BILTMORE HOTEL, LOS ANGELES, OCTOBER 18 TO 22, 1948

IMPETUS to the importance of Los Angeles as a medical center will be given by the thirty-fourth Clinical Congress of the American College of Surgeons, to be held during the five days, October 18 to 22, 1948. This will be the first time that Los Angeles has been selected as the Clinical Congress City, and only twice before has the Congress been held west of the Mississippi River—in 1935 in San Francisco and in 1932 in St. Louis. Surgeons and hospital personnel in 24 hospitals in Los Angeles and vicinity are preparing an extensive program of operative and non-operative clinics, some of which will be televised to the headquarters hotel so that large numbers of the visitors may view the work which is being done in surgery in the fast growing metropolis of the West. The preliminary schedule of the clinics, demonstrations, and other presentations to be given at the hospitals, which appears in succeeding pages, will be finally revised and amplified immediately preceding the Congress and published in a *Clinical Bulletin* which will be distributed each day at the headquarters hotel, The Biltmore.

In the hotel and nearby auditoriums there will be a series of scientific sessions, official meetings, Hospital Standardization conferences, medical motion picture showings, telecasts of operations, and scientific and technical exhibits, throughout the five days of the Congress. Surgeons of high standing in the United States and Canada and one speaker from Stockholm, Sweden, will address the meetings and lead discussions on subjects in general surgery, obstetrics and gynecology, fractures, orthopedic surgery, thoracic surgery, neurosurgery, genitourinary surgery, and ophthalmology and otorhinolaryngology. Preliminary programs for these sessions appear on succeeding pages.

The Clinical Congress will attract a number of visitors from South America and other foreign countries. It is regarded as one of the outstanding events of the year from the standpoint of advancement of medical science.

GENERAL ASSEMBLY

The first event on the Clinical Congress program will be the General Assembly for surgeons and hospital representatives which will be held on Monday morning, October 18, at 10:00 o'clock. Dr. Arthur W. Allen, president of the College, will preside at this meeting which will be the first session of the twenty-seventh annual Hospital Standardization Conference. Dr. Allen will discuss "Looking Forward with Hospital Standardization" and Dr. Irvin Abell, chairman of the Board of Regents, will describe "Activities of the American College of Surgeons—a Dynamic Program." Rev. John J. Flanagan, S.J., St. Louis, executive director of the Catholic Hospital Association, will speak on the "Preservation of the Voluntary Hospital System"; and James A. Hamilton, Minneapolis, Professor of Hospital Administration, University of Minnesota, will describe "The Hospital of Tomorrow."

The program will conclude with a premiere showing of the film "Introduction to Fractures" sponsored by the American College of Surgeons and the Committee on Fractures and Other Traumas, and made possible through a grant from the Johnson & Johnson Research Foundation. Dr. Charles B. Puestow, Chicago, chairman of the Committee on Medical Motion Pictures of the American College of Surgeons will briefly describe the value of films in medical education and the new film will be introduced by Dr. Robert H. Kennedy of New York, clinical professor of surgery, New

York University, Post-Graduate Division, and chairman of the Committee on Fractures and Other Traumas of the American College of Surgeons.

PRESIDENTIAL MEETING

The opening evening session of the Clinical Congress will be devoted to the Presidential Meeting, at which the officers-elect, consisting of Dr. Dallas B. Phemister of Chicago as president, Dr. Howard A. Patterson of New York as first vice president, and Dr. Carl H. McCaskey of Indianapolis as second vice president will be installed. Dr. Arthur W. Allen of Boston, outgoing president and vice-chairman of the Board of Regents, will preside and will deliver the Presidential Address on the subject, "Looking Forward." The third Martin Memorial Lecture will be delivered by Dr. Clarence Crafoord, professor of surgery, University of Stockholm. Dr. Crafoord's subject will be "Some Aspects of the Development of Intrathoracic Surgery."

CONVOCATION

The Annual Convocation will be held on the final evening, Friday. The formal initiation ceremonies and the presentation of the Fellowship Address by Dr. George W. Beadle, Professor of Biology and chairman, Department of Biology, California Institute of Technology, Pasadena, will constitute the program. Dr. Beadle's subject will be, "Hereditary Errors in Metabolism."

ASSEMBLY OF INITIATES

The 1948 initiates will attend an assembly on Friday afternoon from 1:30 to 2:15 o'clock in the Temple, Baptist Church. Dr. Dallas B. Phemister, incoming president of the College, will preside. Dr. Irvin Abell, chairman of the Board of Regents, and Dr. Malcolm T. MacEachern, Dr. H. Prather Saunders and Dr. Charles F. Branch will briefly outline the program of the College.

OTHER OFFICIAL MEETINGS

The annual meeting of the Governors and Fellows of the College will be held on Thursday afternoon at 1:30 o'clock. Reports on activities of the American College of Surgeons will be presented by the officers and chairmen of the standing committees, followed by the election of officers.

Meetings of three important committees will be held on Wednesday as follows: State and Provincial Executive Committees, 9:00 to 10:00 a.m.; State and Provincial Credentials Committees and Committees on Applicants and Judiciary Committees, 10:00 to 11:00 a.m.; and National and Regional Fracture Committees, 3:30 to 5:00 p.m. The Committee on the Library will meet on Thursday from 3:00 to 4:00 p.m. A dinner for the members of the Committee on Fractures and Other Traumas, and for the chairmen of the Regional Committees, will be held from 6:00 to 8:00 p.m. on Thursday.

FORUM ON FUNDAMENTAL SURGICAL PROBLEMS

The Forum on Fundamental Surgical Problems, one of the most popular features of Clinical Congresses during the past few years, will be held on Tuesday through Friday mornings, in two sections meeting concurrently. Brief reports of original clinical and experimental observations relating to the broad aspects of surgery and the surgical specialties will be presented, under the general direction of Dr. Owen H. Wangensteen, chairman of the committee, Forum on Fundamental Surgical Problems.

GENERAL SURGERY

In general surgery, the program at the headquarters hotel will embrace three evening symposia and seven afternoon panel discussions.

On Thursday afternoon there will be only one panel discussion, from 3:30 to 5:00.

Detailed programs are published on succeeding pages.

SURGICAL SPECIALTIES

Panel discussions on the surgical specialties will be held on Friday afternoon from 1:30 to 4:45 o'clock. The panels will be held concurrently in the following fields: urology, orthopedic surgery, neurological surgery, gynecology and obstetrics, thoracic surgery, and plastic surgery. Programs are shown on succeeding pages.

OPHTHALMOLOGY

The program for ophthalmologists will consist of two evening sessions, three morning panel discussions from 9:00 to 10:30, and an evening session on Wednesday in which a combined program with the otorhinolaryngologists will be held.

OTORHINOLARYNGOLOGY

The program in otorhinolaryngology will consist of two evening meetings, an evening session on Wednesday in which a combined program with the ophthalmologists will be held, and three morning panel discussions from 10:45 to 12:15. The fact that the morning panel discussions are planned to follow those on ophthalmology will enable surgeons who combine these specialties in their practice to attend both sessions.

SYMPOSIA ON CANCER

On Tuesday afternoon from 2:00 to 5:00 a Symposium on "Cancer Is Curable" will be held at which surgeons will report on series of cancer survivals, without recurrence, of from five to twenty-five years, and the College will report the additions to its Archives of Cancer Cures.

On Wednesday afternoon from 2:00 until 5:00 o'clock a Symposium on Cancer, with Dr. Grantley W. Taylor of Boston, chairman of the Cancer Committee, American College of Surgeons, presiding, is scheduled. The list of subjects together with the speakers is published on another page.

SYMPOSIUM ON FRACTURES AND OTHER TRAUMAS

Dr. Robert H. Kennedy of New York, chairman, Committee on Fractures and Other Traumas, will preside at the Symposium on Fractures and Other Traumas which will be held on Tuesday from 2:00 to 5:00 p.m. The speakers are listed in the outline of the program which appears on succeeding pages.

SYMPOSIUM ON GRADUATE TRAINING IN SURGERY AND THE SURGICAL SPECIALTIES

Dr. Frederick A. Coller of Ann Arbor, chairman, Committee on Graduate Training in Surgery of the College, will preside at the Symposium on Graduate Training in Surgery and the Surgical Specialties which will be held on Thursday afternoon rom 3:00 to 5:00 o'clock.

HOSPITAL STANDARDIZATION CONFERENCE

The first formal session of the Clinical Congress will be the opening meeting of the twenty-seventh Hospital Standardization Conference at 10:00 o'clock on Monday morning, October 18. The plans for this meeting are described on a preceding page under the heading, "General Assembly," and the preliminary outline of the program is included in a later section.

The hospital conferences will continue on Monday afternoon, with sessions following on Tuesday, Wednesday, and Thursday mornings, afternoons, and evenings, and all day Friday when visits will be arranged to hospitals in Los Angeles and vicinity, with the cooperation of the Southern California Hospital Council, to study special features and observe procedures in general.

Hospital administrators, members of governing boards, medical staff members, heads of the various hospital departments and their personnel, nurses, dietitians, medical records librarians, and many other persons directly concerned about hospital progress, will be interested in the timely discussions of a wide range of hospital problems.

Aiding with the program are the following members of the Hospital Standardization Conference committee: Ritz E. Heerman, superintendent, The California Hospital, chairman; Paul C. Elliott, superintendent, Hollywood Presbyterian Hospital and President, Southern California Hospital Council; and Alden B. Mills, administrator, Huntington Memorial Hospital, Pasadena.

A joint session with the American Association of Medical Record Librarians will be held on Wednesday afternoon. A forum on fundamental administrative problems, with administrative interns and graduates of the schools of hospital administration as the participants, will be held on Thursday afternoon.

The evening meetings will be as follows: Tuesday evening: a round table conference on Hospital Standardization and the Point Rating System; Wednesday evening: a forum for hospital trustees and administrators; Thursday evening: a panel discussion on "Nursing the Patient" with the subject presented from various points of view.

COMMITTEE ON ARRANGEMENTS

A list of the members of the Committee on Arrangements for the Clinical Congress in Los Angeles follows:

General Committee

Donald G. Tollefson, M.D., F.A.C.S., *Chairman*
Hugh T. Jones, M.D., F.A.C.S., *Vice-Chairman*
Harold Lincoln Thompson, M.D., F.A.C.S., *Secretary-Treasurer*
Gilbert J. Thomas, M.D., F.A.C.S., *Regent of the College*
E. Vincent Askey, M.D., F.A.C.S.
Max W. Bay, M.D., F.A.C.S.
J. MacKenzie Brown, M.D., F.A.C.S.
Lawrence Chaffin, M.D., F.A.C.S.
A. Ray Irvine, M.D., F.A.C.S.
Maurice Kahn, M.D., F.A.C.S.
W. E. MacPherson, M.D.
B. O. Raulston, M.D.
Louis J. Regan, M.D.
Carl Rusche, M.D., F.A.C.S.
Stafford Warren, M.D.

Committee for the Southern California Chapter

Ray B. McCarty, M.D., F.A.C.S., Riverside
Meredith G. Beaver, M.D., F.A.C.S., Redlands
Clarence E. Rees, M.D., F.A.C.S., San Diego
Carl G. Johnson, M.D., F.A.C.S., Long Beach
James H. Saint, M.D., F.A.C.S., Santa Barbara

Hospital Committee

The members of the hospital committee are listed on succeeding pages with the list of hospitals participating in the clinical program.

MEDICAL MOTION PICTURES

An appreciated feature of the Clinical Congress will again be the showing of medical motion pic-

tures each day. The latest available pictures on surgery and related subjects will be presented. Special showings will be arranged of medical motion pictures in the fields of ophthalmology and otorhinolaryngology. Both sound and silent films will be shown, all of which will have been approved by the Committee on Motion Pictures. Some of the newer medical motion pictures now under production will be shown.

TECHNICAL AND SCIENTIFIC EXHIBITIONS

The Technical and Scientific Exhibits will occupy the Ballroom foyer, the Renaissance Room, and the Galleria of the Biltmore Hotel, according to present plans. Leading manufacturers of surgical instruments, x-ray apparatus, sterilizers, operating room lights, ligatures, dressings, hospital apparatus, supplies, and pharmaceuticals, and publishers of medical books will be represented.

ENTERTAINMENT FOR LADIES AND GUESTS

The Committee on Arrangements is planning a most interesting program for the wives and other guests of Fellows who are attending the Clinical Congress. Among the events planned are motor tours in and around Los Angeles to include such attractions as the Huntington Library, Griffith Park Planetarium, Olvera Street, Chinatown, visits to Hollywood studios and homes of motion picture stars, and radio broadcasts. Tickets to the broadcasts will be available upon request only at the registration desk at the Biltmore Hotel.

There will be a separate charge for each of the entertainment events. Each Fellow who registers in advance will receive a card listing the entertainment activities which he must check, if he is interested, and return the card accompanied by personal check to cover the total amount to Mrs Verne C. Hunt, Box 95, San Marino, California.

ADVANCE REGISTRATION

Surgeons who wish to attend the Congress should register in advance. Under a new plan, advance registration will greatly expedite the procedure of registering.

No registration fee will be charged Fellows whose dues are paid to December 31, 1947. For endorsed Junior and Senior Candidates, the fee will be $5.00. Non-Fellows who after individual consideration are permitted to register, will pay a fee of $10.00.

No registration fee will be required of initiates of the class of 1948.

HOTEL RESERVATIONS

It is desirable to make hotel reservations as early as possible because of the shortage of hotel rooms that prevails in Los Angeles as well as in other cities. In making these, communications should be addressed to the Los Angeles Convention and Visitors' Bureau, care of the Los Angeles Chamber of Commerce, stating that you will be attending the Clinical Congress of the American College of Surgeons. All hotel reservations for the Clinical Congress are to clear through this Bureau. No correspondence should be sent directly to the hotels. A form for reservations was enclosed in the letter recently sent to Fellows. Choice of hotels may be designated. The hotels in Los Angeles require a deposit in advance.

CLINICAL CONGRESS PROGRAM IN BRIEF

Monday, October 18

8:00–12:00 Clinics and Demonstrations—Local Hospitals
10:00–12:30 General Assembly—Ballroom
1:30– 3:00 Panel Discussion—Philharmonic Auditorium
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl (Lower Level)
2:00– 5:00 Clinics and Demonstrations—Local Hospitals
2:00– 5:00 Hospital Conference—Ballroom
3:30– 5:00 Panel Discussion—Philharmonic Auditorium
8:15–10:30 Presidential Meeting—Philharmonic Auditorium

Tuesday, October 19

8:00– 1:00 Clinics and Demonstrations—Local Hospitals
8:30–12:00 Forum on Fundamental Surgical Problems—Philharmonic Auditorium
8:30–12:00 Forum on Fundamental Surgical Problems—Ballroom
9:00–10:30 Panel Discussion, Ophthalmology—Conference Room No. 1
9:30–12:30 Surgical Film Exhibition (General)—Biltmore Theater
10:00–12:30 Hospital Conference—Music Room
10:00–12:00 Television, General Surgery—Foyer, Biltmore Bowl
10:45–12:15 Panel Discussion—Otorhinolaryngology—Conference Room No. 1
1:30– 3:00 Panel Discussion—Philharmonic Auditorium
1:30– 5:30 Clinics and Demonstrations—Local Hospitals
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl
2:00– 4:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
2:00– 5:00 Hospital Standardization Conference—Music Room
2:00– 5:00 Symposium: Cancer Is Curable—Ballroom
2:00– 5:00 Symposium on Fractures and other Traumas—Biltmore Theater
3:30– 5:00 Panel Discussion—Philharmonic Auditorium

7:00– 8:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
8:00–10:30 Hospital Conference—Music Room
8:00–10:30 Scientific Session, General Surgery—Philharmonic Auditorium
8:00–10:30 Scientific Session, Ophthalmology—Conference Room No. 1
8:00–10:30 Scientific Session, Otorhinolaryngology—Conference Room No. 2

Wednesday, October 20

7:45– 9:45 Breakfast Conference—Press and Radio Representatives and Hospital Personnel—Conference Room No. 2
8:00– 9:00 Meeting of Cancer Committee—Conference Room No. 6
8:00– 1:00 Clinics and Demonstrations—Local Hospitals
8:30–12:00 Forum on Fundamental Surgical Problems—Ballroom
8:30–12:00 Forum on Fundamental Surgical Problems—Philharmonic Auditorium
9:00–10:00 Panel Discussion-Ophthalmology—Conference Room No. 1
9:00–10:00 State and Provincial Executive Committees—West Gold Room, Ambassador Hotel
9:30–12:30 Surgical Film Exhibition (General)—Biltmore Theater
10:00–12:30 Hospital Conference—Music Room
10:00–12:00 Television, General Surgery—Foyer, Biltmore Bowl (Lower Level)
10:00–11:00 State and Provincial Credentials Committees and Committees on Applicants and Judiciary Committees—West Gold Room, Ambassador Hotel.
10:45–12:15 Panel Discussion, Otorhinolaryngology—Conference Room No. 1
12:15– 2:00 Luncheon—Meeting of Board of Governors—West Gold Room, Ambassador Hotel
1:30– 3:00 Panel Discussion—Philharmonic Auditorium
1:30– 5:30 Clinics and Demonstrations—Local Hospitals
2:00– 4:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl (Lower Level)
2:00– 5:00 Symposium on Cancer—Ballroom
2:00– 5:00 Hospital Conference—Music Room
3:30– 5:00 Panel Discussion—Philharmonic Auditorium
3:30– 5:00 Meeting of National and Regional Fracture Committees—Conference Room No. 2
7:00– 8:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
8:00–10:00 Combined Session, Ophthalmology and Otorhinolaryngology—Conference Room No. 1
8:00–10:30 Scientific Session, General Surgery—Philharmonic Auditorium
8:00–10:30 Hospital Conference—Music Room

Thursday, October 21

8:00– 1:00 Clinics and Demonstrations—Local Hospitals
8:30–12:00 Forum on Fundamental Surgical Problems—Ballroom
8:30–12:00 Forum on Fundamental Surgical Problems—Philharmonic Auditorium
9:00–10:30 Panel Discussion, Ophthalmology—Conference Room No. 1
9:00–12:00 Surgical Film Exhibition (General)—Biltmore Theater
10:00–12:30 Hospital Conference—Music Room
10:00–12:00 Television, General Surgery—Foyer, Biltmore Bowl
10:45–12:15 Panel Discussion, Otorhinolaryngology—Conference Room No. 1
1:30– 1:45 Adjourned Meeting, Governors—Ballroom
1:45– 3:00 Annual Meeting, Fellows—Ballroom
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl
2:00– 5:00 Clinics and Demonstrations—Local Hospitals
2:00– 5:00 Hospital Conference—Music Room
2:30– 5:00 Surgical Film Exhibition (General)—Biltmore Theater
3:00– 4:00 Committee on The Library—Conference Room No. 6
3:00– 5:00 Symposium, Graduate Training in Surgery—Ballroom
3:30– 5:00 Panel Discussion—Philharmonic Auditorium
6:00– 8:00 Dinner for Committee on Fractures and Other Traumas and Chairmen, Regional Committees—Engineers' Club
7:00– 8:00 Surgical Film Exhibition (E.E.N.T.)—Conference Room No. 1
8:00–10:30 Hospital Conference—Music Room
8:00–10:30 Scientific Session-General Surgery—Philharmonic Auditorium
8:00–10:30 Scientific Session-Ophthalmology—Conference Room No. 1
8:00–10:30 Scientific Session-Otorhinolaryngology—Conference Room No. 8

Friday, October 22

8:00– 1:00 Clinics and Demonstrations—Local Hospitals
8:30–12:00 Forum on Fundamental Surgical Problems—Ballroom
8:30–12:00 Forum on Fundamental Surgical Problems—Philharmonic Auditorium
9:30–10:30 Surgical Film Exhibition (E.E.N.T.)—Biltmore Theater
9:30–12:00 Hospital Conference—Visits to Hospitals
10:00–12:00 Television, General Surgery—Foyer, Biltmore Bowl
10:30–12:30 Surgical Film Exhibition (General)—Biltmore Theater
1:30– 2:15 Assembly of Initiates—Temple Baptist Church
1:30– 4:30 Hospital Conference—Visits to Hospitals
1:30– 4:45 Panel Discussions for each of the following:
Gynecology and Obstetrics—Conference Room No. 2
Plastic Surgery—Conference Room No. 1
Neurological Surgery—Ballroom
Thoracic Surgery—Burdette Hall, Temple Baptist Church
Urology—Auditorium, Southern California Edison Building
Orthopedic Surgery—Biltmore Theater
2:00– 4:00 Television, Surgical Specialties—Foyer, Biltmore Bowl
2:00– 5:00 Clinics and Demonstrations—Local Hospitals
7:30– 8:00 Assembly of Initiates for Processional—Temple Baptist Church
8:15–10:30 Convocation—Philharmonic Auditorium

GENERAL ASSEMBLY

JOINT SESSION—SURGEONS AND HOSPITAL REPRESENTATIVES

Monday, 10:00 a.m.—12:30 p.m.—Ballroom—Biltmore Hotel

ARTHUR W. ALLEN, M.D., F.A.C.S., Boston; President, American College of Surgeons, Presiding.

Address of Welcome from the City of Los Angeles. HONORABLE FLETCHER BOWRON, Los Angeles; Mayor of City of Los Angeles.

Greetings from the Association of Western Hospitals. HORACE TURNER, Spokane; President.

Looking Forward With Hospital Standardization. ARTHUR W. ALLEN, M.D., Boston.

Activities of the American College of Surgeons—A Dynamic Program. IRVIN ABELL, M.D., F.A.C.S., Louisville; Chairman, Board of Regents.

Preservation of the Voluntary Hospital System. REV. JOHN J. FLANAGAN, S.J., St. Louis; Executive Director, Catholic Hospital Association.

The Hospital of Tomorrow. JAMES A. HAMILTON, Minneapolis; Professor and Director, Course in Hospital Administration, University of Minnesota; Hospital Consultant.

The Value of Motion Pictures in Medical Education. CHARLES B. PUESTOW, M.D., M.Sc., Ph.D., F.A.C.S., Chicago; Professor of Surgery and Assistant Dean in Charge of Education in Surgery, University of Illinois College of Medicine and Illinois Post-Graduate Medical School; Chief Surgical Consultant, Veterans Administration Hospital, Hines; Chairman, Committee on Medical Motion Pictures, American College of Surgeons.

Premiere Showing: An Introduction to FRACTURES. Film Directed by Harrison L. McLaughlin, M. D., New York; Assistant Professor of Clinical Orthopedic Surgery, Columbia University College of Physicians and Surgeons.

(*Sponsored by the American College of Surgeons and Committee on Fractures and Other Traumas, and made possible through a grant from the Johnson & Johnson Research Foundation.*)

Introduced by ROBERT H. KENNEDY, M.D., F.A.C.S., New York; Clinical Professor of Surgery, New York University College of Medicine, Post-Graduate Division; Chairman, Committee on Fractures and Other Traumas, American College of Surgeons.

EVENING SCIENTIFIC SESSIONS

GENERAL SURGERY

Tuesday, 8:00–10:30 p.m.

Symposium on Malignant Lesions of the Thyroid Gland

Histologic Types of Thyroid Carcinoma and Their Clinical Significance. FRANK W. FOOTE, M.D., New York.

Aberrant Thyroid. BRIEN T. KING, M.D., F.A.C.S., Seattle.

Malignancy in Nodular Goiter. WARREN H. COLE, M.D., F.A.C.S., Chicago.

Radioactive Iodine for the Treatment of Thyroid Disease Including Carcinoma. MYRON PRINZMETAL, M.D., Los Angeles.

Wednesday, 8:00–10:30 p.m.

Fracture Oration. Colles' Fracture. HENRY C. MARBLE, M.D., F.A.C.S., Boston.

Symposium on Endometriosis

Etiology of Endometriosis. BROOKS RANNEY, M.D., Chicago.

Surgical Procedures Involved in the Treatment of Endometriosis. VIRGIL S. COUNSELLER, M.D., F.A.C.S., Rochester, Minnesota.

The Medical Treatment and Significance of Endometriosis. JOE V. MEIGS, M.D., F.A.C.S., Boston.

Thursday, 8:00–10:30 p.m.

Symposium on Surgery of the Heart and Great Vessels

Surgical Treatment of Pulmonic Stenosis. ALFRED BLALOCK, M.D., F.A.C.S., Baltimore.

The Surgical Treatment of Constrictive Pericarditis. EMILE F. HOLMAN, M.D., F.A.C.S., San Francisco

The Surgery of Patent Ductus Arteriosus. JOHN C. JONES, M.D., F.A.C.S., Los Angeles.

Treatment of Coarctation of the Aorta. ROBERT E. GROSS, M.D., F.A.C.S., Boston.

OPHTHALMOLOGY

Tuesday, 8:00–10:30 p.m.

Tumors of the Eyelids and the Conjunctiva. MICHAEL J. HOGAN, M.D., San Francisco.
Partial Keratectomy. GEORGE L. KILGORE, M.D., San Francisco.
Diathermy Cauterization of the Ciliary Body for Glaucoma. SAMUEL J. MEYER, M.D., F.A.C.S., Chicago.

Thursday, 8:00–10:30 p.m.

The Use of Retrobulbar Alcohol Injection for Ocular Pain. ALFRED E. MAUMENEE, M.D., Baltimore.
The Differential Diagnoses of Retinal Detachment and its Operative Treatment, DOHRMANN K. PISCHEL, M.D., San Francisco.
Correlation of the Anatomic Factors Concerned in the Ophthalmoscopic Appearance of Retinal Hemorrhages. HOMER E. SMITH, M.D., Salt Lake City.

OTORHINOLARYNGOLOGY

Tuesday, 8:00–10:30 p.m.

Effects of Streptomycin on Eighth Nerve Function. PAGE NORTHINGTON, M.D., F.A.C.S., Oakland.
Anatomical Considerations in Ear Surgery. J. BROWN FARRIOR, M.D., F.A.C.S., Tampa.
Chronic Laryngeal Stenosis. JOHN B. ERICH, M.D., F.A.C.S., Rochester, Minnesota.

Thursday, 8:00–10:30 p.m.

Present Day Status of Fenestration Surgery. LEIGHTON F. JOHNSON, M.D., F.A.C.S., Boston.
Tumors of the Nasopharynx. HARRY C. ROSENBERGER, M.D., F.A.C.S., Cleveland.
The Modern Management of Oro-Antral Fistula. RICHARD THOMAS BARTON, M.D., Beverly Hills.
Surgical Treatment of Laryngeal Cancer. CHEVALIER L. JACKSON, M.D., F.A.C.S., Philadelphia.

COMBINED SESSION—OPHTHALMOLOGY—OTORHINOLARYNGOLOGY

PANEL DISCUSSION

Wednesday, 8:00–10:30 p.m.

Neoplasms of the Eyelids, Orbit, Nose and Accessory Sinuses; Treatment and Plastic Repair.
Moderator: GORDON B. NEW, M.D., F.A.C.S., Rochester, Minnesota.
Collaborators: AUBREY G. RAWLINS, M.D., San Francisco; EDMUND B. SPAETH, M.D., F.A.C.S., Philadelphia; JOHN B. ERICH, M.D., F.A.C.S., Rochester, Minnesota; MICHAEL J. HOGAN, M.D., San Francisco.

PANEL DISCUSSIONS

GENERAL SURGERY

Monday, 1:30–3:00 p.m.

Acute Renal Failure in Surgical Patients
Moderator: FREDERICK A. COLLER, M.D., F.A.C.S., Ann Arbor.
Collaborators: CHARLES D. CREEVY, M.D., Minneapolis; ERNEST E. MUIRHEAD, M.D., Dallas; WILLIAM O. RUSSELL, M.D., Santa Barbara.

Monday, 3:30–5:00 p.m.

Tumors of the Mouth, Jaw and Face
Moderator: GORDON B. NEW, M.D., F.A.C.S., Rochester, Minnesota.
Collaborators: LOUIS T. BYARS, M.D., F.A.C.S., St. Louis; J. ELLIOTT SCARBOROUGH, JR., M.D., F.A.C.S., Atlanta; ERNEST M. DALAND, M.D., F.A.C.S., Boston.

Tuesday, 1:30–3:00 p.m.

Low Lying Malignant Lesions of the Bowel
Moderator: FRED W. RANKIN, M.D., F.A.C.S., Lexington.
Collaborators: R. KENNEDY GILCHRIST, M.D., F.A.C.S., Chicago; THOMAS E. JONES, M.D., F.A.C.S., Cleveland; JESSIE GRAY, M.D., Toronto.

Tuesday, 3:30–5:00 p.m.

Evaluation of Liver Function in Relation to Surgery
Moderator: NATHAN A. WOMACK, M.D., F.A.C.S., Iowa City.
Collaborators: EVERETT I. EVANS, M.D., F.A.C.S., Richmond; ARTHUR H. BLAKEMORE, M.D., New York; JESSE L. BOLLMAN, M.D., Rochester, Minnesota.

Wednesday, 1:30–3:00 p.m.

Peripheral Arterial Disease
Moderator: ALTON OCHSNER, M.D., F.A.C.S., New Orleans.
Collaborators: NORMAN E. FREEMAN, M.D., F.A.C.S., San Francisco; I. RIDGEWAY TRIMBLE, M.D., Baltimore; ROBERT R. LINTON, M.D., F.A.C.S., Boston.

Wednesday, 3:30–5:00 p.m.

Ulcerative Colitis
Moderator: HENRY W. CAVE, M.D., F.A.C.S., New York.
Collaborators: ALBERT J. SULLIVAN, M.D., New Orleans; CLARENCE DENNIS, M.D., Minneapolis; CLAUDE F. DIXON, M.D., F.A.C.S., Rochester, Minnesota.

Thursday, 3:30–5:00 p.m.

Isotopes in Surgery
Moderator: GEORGE M. CURTIS, M.D., F.A.C.S., Columbus.
Collaborators: EARL R. MILLER, M.D., San Francisco; JOSEPH G. HAMILTON, M.D., Berkeley; OLIVER COPE, M.D., F.A.C.S., Boston; BEVERLY C. SMITH, M.D., F.A.C.S., New York.

SURGICAL SPECIALTIES, *Friday, 1:30–4:55 p.m.*

UROLOGY

Moderator: REED M. NESBIT, M.D., F.A.C.S., Ann Arbor.

Present Day Management of Urinary Tract Infections
Collaborators: GRAYSON CARROLL, M.D., F.A.C.S., St. Louis; WILLOUGHBY E. KITTREDGE, M.D., F.A.C.S., New Orleans; GILBERT J. THOMAS, M.D., F.A.C.S., Beverly Hills.

The Clinical Management of Branched Renal Calculi
Collaborators: JAMES T. PRIESTLY, M.D., F.A.C.S., Rochester, Minnesota; RUBIN H. FLOCKS, M.D., F.A.C.S., Iowa City; THOMAS E. GIBSON, M.D., F.A.C.S., San Francisco.

ORTHOPEDIC SURGERY

Moderator: JOHN C. WILSON, M.D., F.A.C.S., Los Angeles.

Mechanical Derangements of the Knee Joint
Collaborators: DOUGLAS D. TOFFELMIER, M.D., Oakland; FRANCIS J. COX, M.D., San Francisco; FRANCIS E. WEST, M.D., San Diego.

Fractures About the Hip
Collaborators: J. SIMS NORMAN, M.D., F.A.C.S., Pueblo; JOHN J. LOUTZENHEISER, M.D., San Francisco; JAMES K. STACK, M.D., F.A.C.S., Chicago.

NEUROLOGICAL SURGERY

Moderator: HOWARD C. NAFFZIGER, M.D., F.A.C.S., San Francisco.

Cerebral Angiography
Collaborators: CARL F. LIST, M.D., F.A.C.S., Grand Rapids; EDWIN B. BOLDREY, M.D., F.A.C.S., San Francisco; EARL R. MILLER, M.D., San Francisco; WALLACE B. HAMBY, M.D., F.A.C.S., Buffalo; JAMES L. POPPEN, M.D., F.A.C.S., Boston.

GYNECOLOGY AND OBSTETRICS

Moderator: JOHN C. BURCH, M.D., F.A.C.S., Nashville.

Hysterectomy. Physiological Considerations—Indications
Collaborators: LANGDON PARSONS, M.D., F.A.C.S., Boston; CONRAD G. COLLINS, M.D., F.A.C.S., New Orleans; R. GLENN CRAIG, M.D., F.A.C.S., San Francisco; KARL H. MARTZLOFF, M.D., F.A.C.S , Portland.

Hysterectomy. Technical Considerations—Complications
Collaborators: (Same as above)

THORACIC SURGERY

Moderator: FRANK S. DOLLEY, M.D., F.A.C.S., Los Angeles.

Diagnosis and Surgical Treatment by Pulmonary Resection for Carcinoma, Bronchiectasis, and Tuberculosis
Collaborators: EVARTS A. GRAHAM, M.D., F.A.C.S., St. Louis; FRANK B. BERRY, M.D., F.A.C.S., New York; HERBERT C MAIER, M.D., F.A.C.S., New York.

Surgery of the Esophagus
Collaborators: RALPH H. ADAMS, M.D., F.A.C.S , Louisville; LYMAN A. BREWER, III, M.D., F.A.C.S., Los Angeles; JOHN W. STRIEDER, M.D., Boston.

PLASTIC SURGERY

Moderator: TRUMAN G. BLOCKER, JR., M.D., F.A.C.S., Galveston.

Congenital Facial Deformities
Collaborators: DOUGLAS W. MACOMBER, M.D., F.A.C.S., Denver; WILLIAM S. KISKADDEN, M.D., F.A.C.S., Los Angeles; THOMAS D. CRONIN, M.D., F.A.C.S., Houston; WALLACE H. STEFFENSEN, M.D., F A.C.S., Grand Rapids.

Burn Contractures of the Extremities
Collaborators: GEORGE V. WEBSTER, M.D., F.A.C.S., Pasadena; GERALD B. O'CONNOR, M.D., F.A.C.S., San Francisco; LOUIS T. BYARS, M.D., F.A.C.S., St. Louis; NATHANIEL B. SODERBERG, M.D., F.A.C.S., Phoenixville, Pennsylvania.

OPHTHALMOLOGY

Tuesday, 9:00–10:30 a.m.

Surgical Management of Glaucoma
Moderator: A. RAY IRVINE, M.D., F.A.C.S., Los Angeles.
Collaborators: CLAUDE S. MUMMA, M.D., F.A.C.S., Los Angeles; ROBERT N. SHAFFER, M.D., San Francisco; J. HEWITT JUDD, M.D., Omaha.

Wednesday, 9:00–10:30 a.m.

Congenital Cataract
Moderator: OTTO BARKAN, M.D., San Francisco.
Collaborators: S. RODMAN IRVINE, M.D., F.A.C.S., Los Angeles; HAROLD F. WHALMAN, M.D., Los Angeles; RAYMOND J. NUTTING, M.D., Oakland.

Thursday, 9:00–10:30 a.m.

Surgery of the Oblique Muscles
Moderator: C. ALLEN DICKEY, M.D., San Francisco.
Collaborators: ORWYN H. ELLIS, M.D., F.A.C.S., Los Angeles; AVERY MORLEY HICKS, M.D , San Francisco; ALFRED R. ROBBINS, M.D., Los Angeles.

OTORHINOLARYNGOLOGY

Tuesday, 10:45 a.m.–12:15 p.m.

Rehabilitation of the Hard of Hearing
Moderator: WALTER P. WORK, M.D., San Francisco.
Collaborators: HOWARD P. HOUSE, M.D., F,A.C.S., Los Angeles; S. RICHARD SILVERMAN, M.D., St. Louis; HAROLD M. E. BOYD, M.D., Los Angeles.

Wednesday, 10:45 a.m.–12:15 p.m.

The Preparation of the Surgical Patient and Post-Operative Care
Moderator: COLBY HALL, M.D., Los Angeles.
Collaborators: VICTOR GOODHILL, M.D., F.A.C,S,, Los Angeles; CHARLES F. MCCUSKEY, M.D., Los Angeles; HAROLD OWENS, M.D., Los Angeles.

Thursday, 10:45 a.m.–12:15 p.m.

Diseases of the Esophagus
Moderator: ALDEN H. MILLER, M.D., Los Angeles.
Collaborators: SIMON JESBERG, M.D., Los Angeles; LEWIS F. MORRISON, M.D., San Francisco; AMBROSE S. CHURCHILL, M.D., Los Angeles

SYMPOSIUM ON FRACTURES AND OTHER TRAUMAS

Tuesday, 2:00–5:00 p.m.

ROBERT H. KENNEDY, M.D., F.A.C.S., New York; Chairman, Committee on Fractures and Other Traumas, Presiding.

Avulsions of the Skin. CARLETON MATHEWSON, JR., M.D., F.A.C.S., San Francisco; Professor of Surgery, Stanford University School of Medicine.

Secondary Closure of Wounds. HARRY C. BLAIR, M.D., F.A.C.S., Portland; Associate Clinical Professor of Orthopedics, University of Oregon Medical School.

Care of Acute Amputations of the Fingers. WALTER C. GRAHAM, M.D., F.A.C.S., Santa Barbara; Attending Orthopedic Surgeon, Santa Barbara Cottage and Santa Barbara General Hospitals.

Fractures of the Lower End of the Humerus in Children. JOHN C. WILSON, M.D., F.A.C.S., Los Angeles; Clinical Professor of Orthopedic Surgery, University of Southern California School of Medicine; Chief, Orthopedic Staff, Children's Hospital.

Wounds of the Heart. R. ARNOLD GRISWOLD, M.D., F.A.C.S., Louisville; Professor and Head, Department of Surgery, University of Louisville School of Medicine.

Acute Arterial Emergencies. JERE W. LORD, Jr., M.D., F.A.C.S., New York; Instructor in Surgery, Cornell University Medical College.

Evaluation of Principles Concerned in Management of Trauma to the Kidney. LAZARUS A. ORKIN, M.D., F.A.C.S., New York; Chief of Clinic and Adjunct in Urology, Beekman-Downtown Hospital.

SYMPOSIUM: CANCER IS CURABLE

Tuesday, 2:00–5:00 p.m.

GRANTLEY W. TAYLOR, M.D., F.A.C.S., Boston; Chairman, Cancer Committee, American College of Surgeons, Presiding.

Value of Statistics in the Curability of Cancer. BOWMAN C. CROWELL, M.D., Chicago; Associate Director, American College of Surgeons and Director of the Department of Clinical Research.

Variables in Attainment of High Rates of Cancer Cures. FREDERICK S. WETHERELL, M.D., F.A.C.S., Syracuse; Senior Attending Surgeon, Syracuse Memorial Hospital; Chairman, Service and Medical Advisory Committee, New York State Division, American Cancer Society.

The Curability of Cancer in Children. SIDNEY FARBER, M.D., Boston; Professor of Pathology, Harvard Medical School; Director, Division of Laboratories and Research, The Children's Medical Center, Boston.

Encouraging Excerpts from Recorded Cancer Experience. FRED J. HODGES, M.D., Ann Arbor; Professor of Roentgenology, University of Michigan; Chairman, Department of Roentgenology, University Hospital.

Present Trends and Five Year Results of Cancer Therapy at Memorial Hospital in New York City. FRANK E. ADAIR, M.D., F.A.C.S., New York; Associate Professor of Clinical Surgery, Cornell University Medical College; Attending Surgeon, Memorial Hospital for Cancer and Allied Diseases.

Cures of Cancer at the Massachusetts General Hospital. GRANTLEY W. TAYLOR, M.D., F.A.C.S., Boston; Associate in Surgery, Harvard Medical School; Chairman, Cancer Committee, American College of Surgeons.

Five Year Cures in a University Hospital. J. ELLIOTT SCARBOROUGH, M.D., F.A.C.S., Atlanta; Associate in Surgery, Emory University School of Medicine; Attending Surgeon and Director of Tumor Clinic, Emory University Hospital.

Five Year Cures in Bronchogenic Carcinoma from the Chest Service of the Barnes Hospital. EVARTS A. GRAHAM, M.D., F.A.C.S., St. Louis; Professor of Surgery, Washington University School of Medicine; Surgeon-in-Chief, Barnes Hospital.

Five Year Cures in Carcinoma of the Large Intestine. GEORGE V. BRINDLEY, M.D., F.A.C.S., Temple, Texas; Lecturer in Surgery, University of Texas Medical School; Chief Surgeon, Scott and White Clinic; and R. R. WHITE, M.D., Temple; Surgeon, Scott and White Clinic.

Cancer of the Colon and Rectum with Particular Reference to the Results of Surgical Treatment. CLAUDE F. DIXON, M.D., F.A.C.S., Rochester; Professor of Surgery, Mayo Foundation, and Surgeon, Mayo Clinic; and R. LEE CLARK, JR., M.D., F.A.C.S., Houston; Director and Surgeon-in-Chief, The University of Texas, M. D. Anderson Hospital for Cancer Research.

Experiences with the Curability of Cancer in Connecticut. EDWARD J. OTTENHEIMER, M.D., F.A.C.S., Willimantic; Chief, Surgical Service, Windham Community Memorial Hospital.

Five Year Results of Treatment, Ellis Fischel State Cancer Hospital. JOHN MODLIN, M.D., Columbia, Missouri; Chief Surgeon, Ellis Fischel State Cancer Hospital.

Cancer Cures in a Veterans Administration Hospital. CHARLES B. PUESTOW, M.D., F.A.C.S., Chicago; Professor of Surgery, University of Illinois College of Medicine; Chief, Surgical Service, Veterans Administration Hospital, Hines.

Report of Five Year Cures of Cancer from Private Practice and from King County Hospital. DONALD V. TRUEBLOOD, M.D., F.A.C.S., Seattle; Chief, Department of Surgery, Doctors Hospital; Director Neoplastic Clinic, King County Hospital.

SYMPOSIUM ON CANCER

Wednesday, 2:00–5:00 p.m.

GRANTLEY W. TAYLOR, M.D., F.A.C.S., Boston; Chairman, Cancer Committee, American College of Surgeons, presiding.

Tumors of the Central Nervous System. EDWIN B. BOLDREY, M.D., F.A.C.S., San Francisco; assistant clinical professor of surgery, University of California Medical School.

Cancer of the Stomach: A Survey of 1004 Cases. STANLEY E. LAWTON, M.D., F.A.C.S., Chicago; assistant professor of surgery, University of Illinois (Rush) College of Medicine.

Lymphomas. SIDNEY FARBER, M.D., Boston; professor of pathology, Harvard Medical School.

Early Diagnosis for Proper Treatment of Cancer of Urinary Bladder. GILBERT J. THOMAS, M.D., F.A.C.S., Beverly Hills; associate clinical professor of surgery (urology), University of Southern California School of Medicine.

Tumors of Parotid. DANELY P. SLAUGHTER, M.D., F.A.C.S., Chicago; assistant professor of surgery, University of Illinois College of Medicine.

Cancer of the Ovary. JOE V. MEIGS, M.D., F.A.C.S., Boston; clinical professor of gynecology, Harvard University Medical School.

SYMPOSIUM ON GRADUATE TRAINING IN SURGERY AND THE SURGICAL SPECIALTIES

Thursday, 3:00–5:00 p.m.

FREDERICK A. COLLER, M.D., F.A.C.S., Chairman, Committee on Graduate Training in Surgery, Presiding.

Progress in Graduate Training.
FREDERICK A. COLLER, M.D.

The Inclusion of Private Patients in the Resources for Graduate Training in Surgery. THEODORE H. SWEETSER, M.D., F.A.C.S., Minneapolis; Clinical Assistant Professor of Surgery, Division of Urology, University of Minnesota.

The Graduate Training Requirements for Specialization in Thoracic Surgery. WILLIAM E. ADAMS, M.D., F.A.C.S., Chicago; Professor of Surgery, University of Chicago, The School of Medicine of the Division of Biological Sciences.

Essentials of Orthopedic Graduate Training and Acceptable Variations in Training. LEROY C. ABBOTT, M.D., F.A.C.S., San Francisco; Professor of Orthopedic Surgery, University of California School of Medicine; Chief, Orthopedic Service, Children's Hospital.

Essentials of and Proposed Changes in Graduate Training Requirements for Specialization in Urology. GILBERT J. THOMAS, M.D., F.A.C.S., Beverly Hills; Clinical Associate Professor of Surgery (Urology), University of Southern California School of Medicine.

PRESIDENTIAL MEETING

Monday, 8:15–10:30 p.m.—The Philharmonic Auditorium

ARTHUR W. ALLEN, M.D., F.A.C.S., Boston; President, American College of Surgeons, Presiding.

Processional—Officers, Regents, and Distinguished Guests

Invocation
The Most Reverend J. FRANCIS A. MCINTYRE, Los Angeles; Archbishop, Archdiocese of Los Angeles

Address of Welcome
DONALD G. TOLLEFSON, M.D., F.A.C.S., Los Angeles:
Chairman, Committee on Arrangements

Introduction of Distinguished Guests
IRVIN ABELL, M.D., F.A.C.S., Louisville;
Chairman, Board of Regents

Address of the Retiring President: Looking Forward
ARTHUR W. ALLEN, M.D.

Inauguration of Officers:
Presented by THOMAS E. JONES, M.D., F.A.C.S., Cleveland;
Retiring First Vice President

First Vice President: HOWARD A. PATTERSON, M.D., F.A.C.S., New York
Second Vice President: CARL H. MCCASKEY, M.D., F.A.C.S., Indianapolis
President: DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago
The Third Martin Memorial Lecture: Some Aspects of the Development of Intrathoracic Surgery
CLARENCE CRAFOORD, M.D., Stockholm, Sweden; Professor of Surgery, Karolinska Mediko-Kirurgiska Institutet

CONVOCATION

Friday, 8:15–10:30 p.m.—The Philharmonic Auditorium

DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago; President, American College of Surgeons, Presiding.
Processional—Initiates, Officers, Regents, and Distinguished Guests
Invocation
The Right Reverend Francis Eric Bloy, Los Angeles; Bishop, Diocese of Los Angeles
Presentation of Initiates for Fellowship
IRVIN ABELL, M.D., F.A.C.S., Louisville;
Chairman, Board of Regents
Fellowship Pledge. Recital by Initiates
Conferring of Fellowships by the President
DALLAS B. PHEMISTER, M.D.
Conferring of Honorary Fellowships
The President
Fellowship Address: Hereditary Errors in Metabolism
GEORGE W. BEADLE, Ph.D., Pasadena, California
Professor and Chairman, Department of Biology, California Institute of Technology
Recessional
Reception by the Officers and Regents for the Initiates and Fellows

ANNUAL MEETING
BOARD OF GOVERNORS OF THE COLLEGE

Wednesday, 12:15 p.m.–2:00 p.m.—West Gold Room, Ambassador Hotel

DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago; President, American College of Surgeons, Presiding.
Statement by the Chairman of the Board of Regents
IRVIN ABELL, M.D., F.A.C.S., Louisville
Brief Reports on the Activities, Problems, and Progress of the American College of Surgeons
ARTHUR W. ALLEN, M.D., F.A.C.S., Boston; Immediate Past President
FREDERICK A. COLLER, M.D., F.A.C.S., Ann Arbor; Regent
Discussion by Governors and Regents

ADJOURNED MEETING,
BOARD OF GOVERNORS OF THE COLLEGE

Thursday, 1:30 p.m.—Ballroom, The Biltmore Hotel

DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago; President, American College of Surgeons, Presiding.
Report of Committee on Nominations to the Board of Governors
Election of Regents of the College

ANNUAL MEETING, FELLOWS OF THE COLLEGE

Thursday, 1:45–3:00 p.m.—Ballroom, The Biltmore Hotel

DALLAS B. PHEMISTER, M.D., F.A.C.S., Chicago; President, American College of Surgeons, Presiding.
Report of Committee on Nominations
Election of Officers and Governors of the College
Report of the Treasurer.
DALLAS B. PHEMISTER, M.D., Chicago; Treasurer
EDWARD G. SANDROK, Comptroller
Cancer Committee
GRANTLEY W. TAYLOR, M.D., F.A.C.S., Boston; Chairman

Committee on Fractures and Other Traumas
ROBERT H. KENNEDY, M.D., F.A.C.S., New York; Chairman
Committee on Graduate Training in Surgery
FREDERICK A. COLLER, M.D., F.A.C.S., Ann Arbor; Chairman
Committee on Medical Motion Pictures
CHARLES B. PUESTOW, M.D., F.A.C.S., Chicago; Chairman
Hospital Department
Hospital Standardization
MALCOLM T. MACEACHERN, M.D., Associate Director
Graduate Training in Surgery
PAUL S. FERGUSON, M.D., Assistant Director, Hospital Activities
GEORGE H. MILLER, M.D., Director of Educational Activities
Sectional Meetings
MALCOLM T. MACEACHERN, M.D., Associate Director
H. PRATHER SAUNDERS, M.D., F.A.C.S., Associate Director
Credentials Department
a. Credentials Committees
b. Committees on Applicants
c. Committee on History Reviews
H. PRATHER SAUNDERS, M.D., F.A.C.S., Associate Director
Clinical Research
Medical Service in Industry
BOWMAN C. CROWELL, M.D., Associate Director
CHARLES F. BRANCH, M.D., Assistant Director
G. R. HESS, M.D., Assistant
Publications
ELEANOR K. GRIMM, Administrative Executive
Library and Department of Literary Research
L. MARGUERIETE PRIME, Director of Library and Department of Literary Research
Public Relations
LAURA G. JACKSON, Director of Public Relations
The American College of Surgeons: Fellowship Obligations and Opportunities
IRVIN ABELL, M.D., F.A.C.S., Louisville; Chairman, Board of Regents

FORUM ON FUNDAMENTAL SURGICAL PROBLEMS

Tuesday, Wednesday, Thursday, Friday, 8:30 a.m.–12:00 m.

Gastric Surgery

8:30 a.m. Tuesday—Philharmonic Auditorium

OWEN H. WANGENSTEEN, M.D., F.A.C.S., Minneapolis; Professor of Surgery, University of Minnesota Medical School, Presiding.

The Effect of Increased Environmental Temperature on Histamine Provoked Ulcer in Dogs. F. JOHN LEWIS, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

Experimental Gastric and Duodenal Ulcer. D. R. WEBSTER, M.D., J. R. MCCORRISTON, M.D., and D. W. MACKENZIE, JR., M.D., Montreal, Quebec. McGill University Faculty of Medicine.

The Effect of Locally Applied Acetylcholine on Gastric Secretion: Studies by the Dye Dilution Technic. F. T. GEPHART, M.D., J. R. BROOKS, M.D., J.M. ERSKINE, M.D., O. B. SWAIM, A.B., and F. D. MOORE, M.D., F.A.C.S., Boston, Massachusetts. Harvard Medical School, Massachusetts General Hospital, and Peter Bent Brigham Hospital.

The Effect of Devascularization of the Stomach on the Production of Mann-Williamson Ulcers. BENTON HOLM, M.D., F.A.C.S., Cadillac, Michigan. University of Vermont College of Medicine.

Effect of Gastrectomy and Diversion of Duodenal Secretions into the Distal Ileum Upon Development of Jejunal Ulcers. JAMES V. OLIVER, M.D., F.A.C.S., Chicago, Illinois. University of Illinois College of Medicine.

A Rationale for the Surgical Treatment of Peptic Ulcer. R. ARNOLD GRISWOLD, M.D., F.A.C.S., and ARTHUR M. SCHOEN, M.D., Louisville, Kentucky. University of Louisville School of Medicine.

Resistance of Explanted Gastric Mucosa to Various Chemical and Physical Agents. J. R. MILLER, M.D., J. R. HERRICK, Ph.D., F. C. MANN, M.D., JOHN H. GRINDLAY, M.D., F.A.C.S., and JAMES T. PRIESTLEY, M.D., F.A.C.S., Rochester, Minnesota. Mayo Foundation.

The Sensibility of the Esophagus to the Acid-Pepsin Action. E. SANCHEZ-PALOMERA, M.D., and YOSHIO SAKO, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

Esophageal Wound Healing: An Experimental Study. ALFONSO TOPETE, M.D., JAMES M. FRITZ, M.D., and WILLIAM E. ADAMS, M.D., F.A.C.S., Chicago, Illinois. University of Chicago College of Medicine.

The Limitations of a Gastric Drainage Operation Upon the Effectiveness of Vagotomy. C. WALTON LILLEHEI, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

The Effect of Vagotomy on Intestinal Motility. SALMAN FAIK, M.D., F. C. MANN, M.D., and JOHN H. GRINDLAY, M.D., F.A.C.S., Rochester, Minnesota. Mayo Foundation.

A New Parasympathetic Stimulant—Ethyl 3:3 Dimethylallyl Barbituric Acid: Its Effect on Gastric Secretion. C. M. BALLEM, M.D., R. L. NOBLE, M.D., D. R. WEBSTER, M.D., and J. R. MCCORRISTON, M.D., Montreal, Quebec. McGill University Faculty of Medicine.

The Use of Buffer and Thrombin in the Control of Gastroduodenal Hemorrhage. BYRNE M. DALY, M.D., Detroit, Michigan. Wayne University College of Medicine.

The Intraduodenal Spread of Malignant Gastric Lesions. CHARLES P. MARVIN, M.D., Atlanta, Georgia.

A Study to Determine a Method of Estimating the Proportion of the Stomach Removed in Partial Gastrectomy. WESTON A. HEINRICH, M.D., Evansville, Indiana. Mayo Foundation.

Thyroid; Thymus; Lungs

8:30 a.m., Tuesday—Ballroom, The Biltmore Hotel

FREDERICK A. COLLER, M.D., F.A.C.S., Ann Arbor; Professor of Surgery, University of Michigan Medical School, Presiding.

Thyroid Cancer: A Problem of Surgery and Pathology. JOHN C. MCCLINTOCK, M.D., F.A.C.S., and GUSTAVUS H. KLINCK, JR., M.D., Albany, New York. Albany Medical College.

An Experimental Study of the Behavior of Residual Thyroid Tissue Following Subtotal Thyroidectomy. THOMAS LEDWICH, M.D., FLOYD MARCHI, M.D., MAYO SOLEY, M.D., EARL MILLER, M.D., GEORGE YEE, M.D., KENNETH SCOTT, Ph.D., and HORACE J. MCCORKLE, M.D., F.A.C.S., San Francisco, California. University of California Medical School.

The Effect of Iodine on the Rat Thyroid Activated by Cooling. ARTHUR J. LESSER, M.D., RICHARD J. WINZLER, Ph.D., and J. B. MICHAELSON, M.S., Los Angeles, California. University of Southern California School of Medicine.

A Clinicopathologic Study of Tumors of the Thymic Region. PHILIP W. SMITH, M.D., Ann Arbor, Michigan University of Michigan Medical School.

The Dyphenylamine Reaction of Human Serum. SUAD NIAZI, M.D., and DAVID STATE, M.D., F.A.C.S., Minneapolis, Minnesota. University of Minnesota Medical School.

Management of Unilateral Total Bronchiectasis by Pneumonectomy. BYRON H. EVANS, M.D., Ann Arbor, Michigan. University of Michigan Medical School.

Prevention of Mediastinal Shift After Pneumonectomy with a Polythene Bag: An Experimental Study. JOHN H. GRINDLAY, M.D., F.A.C.S., J. R. RYDELL, M.D., and O. THERON CLAGETT, M.D., F.A.C.S., Rochester, Minnesota. Mayo Foundation.

The Anatomical Guide to the Intersegmental Plane. BEATTY HAIG RAMSAY, M.D., Cambridge, Massachusetts.

Segmental Resection of the Upper Pulmonary Lobe for Benign Disease: A Plea for Conservation of Lung Tissue. ALFRED HURWITZ, M.D., Newington, Connecticut. Veterans Administration Hospital.

An Evaluation of Oxygen Therapy. JAMES B. HAMMOND, M.D., RALPH C. RICHARDS, M.D., and PHILIP B. PRICE, M.D., F.A.C.S., Salt Lake City, Utah. University of Utah School of Medicine.

A New Type of Artificial Respiration. STANLEY J. SARNOFF, M.D., E. HARDENBERGH, and J. L. WHITTENBERGER, M.D., Boston, Massachusetts. Harvard School of Public Health.

Experimental Embolism of Selected Portions of the Pulmonary Arterial Bed. MASAUKI HARA, M.D., and JOHN R. SMITH, M.D., St. Louis, Missouri. Washington University School of Medicine.

Surgery of the Heart and Great Vessels

8:30 a.m., Wednesday—Philharmonic Auditorium

ROBERT E. GROSS, M.D., F.A.C.S., Boston; Assistant Professor of Surgery, Harvard Medical School, Presiding.

Treatment of Aortic Aneurysms By Wrapping with a Foreign Body. J. KARL POPPE, M.D., F.A.C.S., Portland, Oregon.

The Control of Hemorrhage From Experimental Wounds of the Coronary Vessels. HOWARD G. REISER, M.D., and HILGER P. JENKINS, M.D., F.A.C.S., Chicago, Illinois. University of Illinois College of Medicine and Woodlawn Hospital.

Resection of Left Auricular Appendage: A Prophylaxis in the Treatment of Recurrent Arterial Emboli. JOHN L. MADDEN, M.D., Brooklyn, New York. Long Island College of Medicine and Kings County Hospital.

Extirpation of the Auricular Appendage in the Dog. WALTER J. BURDETTE, M.D., New Orleans, Louisiana. Louisiana State University School of Medicine.

Resection and Grafting of the Thoracic Aorta with Minimal Interruption of the Circulation. CHARLES A. HUFNAGEL, M.D., Boston, Massachusetts. Harvard Medical School.

Studies of Intraradial and Intrafemoral Arterial Pressure and Arterial Pulse Contours Before and After Corrective Surgical Procedures for Coarctation of the Aorta. George E. BROWN, M.D. Twin Falls, Idaho; O. THERON CLAGETT, M.D., F.A.C.S., H. B. BURCHELL, M.D., and E. H. WOOD, M.D., Rochester, Minnesota. Mayo Foundation.

Pump Oxygenator to Replace the Heart and Lungs for Brief Periods. CLARENCE DENNIS, M.D., KARL E. KARLSON, M.D., and DARRELL E. WESTOVER, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

Establishment of Extra-Cardiac Shunts for Treatment of Stenosed Cardiac Valves. ROBERT E. GROSS, M.D., F.A.C.S., E. CONVERSE PEIRCE, II, M.D., HAROLD F. RHEINLANDER, M.D., and ALEXANDER H. BILL, JR., M.D., Boston, Massachusetts. Harvard Medical School and Children's Hospital.

The Rationale and Technic of Extracorporeal Vascular Shunts. LESTER BLUM, M.D., F.A.C.S., and SAMUEL J. MEGIBOW, M.D., New York, New York. Mount Sinai Hospital.

The Creation and Closure of Artificial Atrial Septal Defects in the Dog. W. B. MARTIN, M.D., H. E. ESSEX, Ph.D., H.B. BURCHELL, M.D., and J. EDWARDS, M.D., Rochester, Minnesota. Mayo Foundation.

The Correction of Aortic Insufficiency in Dogs with an Artificial Aortic Valve. J. MOORE CAMPBELL, M.D., F.A.C.S., Oklahoma City, Oklahoma. University of Oklahoma School of Medicine and University Hospitals.

Experimental Superior Vena Caval Obstruction. Treatment by Vein to Vein and Auricle to Vein Anastomosis. FRANK GERBODE, M.D., JAMES YEE, M.D., and F. F. RUNDLE, M.D., San Francisco, California. Stanford University School of Medicine.

Superior Vena Caval Obstruction—A Clinical Study. CHESTER B. NOYES, M.D., San Francisco, California. Stanford University School of Medicine.

Experimental Lesions of the Pulmonary Artery Associated with Patent Ductus Arteriosus. SANFORD E. LEEDS, M.D., F.A.C.S., San Francisco, California.

Quantitative Production of Myocardial Necrosis: Experimental Study with a New Method. CARL DAVIS, JR., M.D., C. B. TAYLOR, M.D., and O. H. AKRE, M.D., Chicago, Illinois. Presbyterian Hospital and University of Illinois College of Medicine.

Bones and Joints; Infection; Skin Preparation; Hemostasis; Plastic Surgery

8:30 a.m., Wednesday—Ballroom, The Biltmore Hotel

MICHAEL L. MASON, M.D., F.A.C.S., Chicago; Associate Professor of Surgery, Northwestern University Medical School, Presiding.

The Suction Socket for Above-Knee Amputees. PAUL E. MCMASTER, M.D., F.A.C.S., and ROBERT MAZET, JR., M.D., F.A.C.S., Los Angeles, California. Veterans Administration Hospital.

Bone Marrow Extension of Primary Neoplasms of Bone. J. E. UPSHAW, M.D., J. R. MACDONALD, M.D., and R. K. GHORMLEY, M.D., F.A.C.S., Rochester, Minnesota. Mayo Foundation.

The Effect of Intramedullary Pinning on the Healing of Fractures—An Experimental Study. WILLIAM T. FITTS, JR., M.D., BROOKE ROBERTS, M.D., STANLEY I. SPOONT, M.D., and VERN W. RITTER, M.D., Philadelphia, Pennsylvania. University of Pennsylvania School of Medicine and Hospital of the University of Pennsylvania.

The Anatomy and Physiology of Nerves to Diarthrodial Joints. ERNEST GARDNER, M.D., Detroit, Michigan. Wayne University College of Medicine.

Streptomycin Therapy of Established Wound Suppuration. MAJOR EDWIN J. PULASKI and LIEUTENANT G. F. CONNELL, JR., M.C., U.S.A., Fort Sam Houston, Texas. Brooke General Hospital.

The Prophylactic Use of Bacitracin in Experimental Clostridial Infections in Guinea Pigs. WILLIAM R. SANDUSKY, M.D., F.A.C.S., and CONSTANCE F. KEEBLE, B.S., Charlottesville, Virginia. University of Virginia Hospital.

Clinical Study of the Use of a Synthetic Detergent Combined with 2,2'-Dihydroxy-3,5,6-3',5'6' Hexachlorodiphenylmethane ("G-11") for Disinfection of the Skin. BROMLEY S. FREEMAN, M.D., F.A.C.S., and THOMAS K. YOUNG, JR., M.D., Temple, Texas. McCloskey Veterans Administration Hospital.

The Use of Quaternary Ammonium Compound for the Surgical Disinfection of Hands. HENRY SWAN, M.D., RICHARD I. GONZALEZ, M.D., ALLEN HARRIS, M.D., C. COULSON, and M. L. HOPWOOD, Denver, Colorado. University of Colorado School of Medicine.

A Study of Action of Detergents on Skin by Biological Methods. RICHARD L. THIRLBY, M.D., and A. BURGESS VIAL, M.D., Ann Arbor, Michigan. University of Michigan Medical School.

Talc Granuloma—A Survey of Its Incidence and Significance. WILLARD B. ROSS, M.D., and JOSEPH M. LUBITZ, M.D., Wood, Wisconsin. Marquette University School of Medicine and Veterans Administration Hospital.

Nonreactive Absorbable Glove Powder. RAYMOND W. POSTLETHWAIT, M.D., H. LEE HOWARD, M.D., and PAUL W. SCHANHER, M.D., Durham, North Carolina. Duke University School of Medicine.

An Experimental Evaluation of a New Glove Powder for Use in the Operating Room. HOWARD C. NAFFZIGER, M.D., F.A.C.S., THOMAS LEDWICH, M.D., FLOYD MARCHI, M.D., and HORACE J. MCCORKLE, M.D., F.A.C.S., San Francisco, California. Department of Experimental Surgery, University of California Medical School.

The Effect of Heparin on Gelfoam Hemostasis. W. J. GROVE, M.D., and C. W. VERMEULEN, M.D., Chicago, Illinois. University of Illinois College of Medicine.

The Use of Skin Grafts in Cleft Palate Repair to Improve Speech Results. HAMILTON BAXTER, M.D., Montreal, Quebec. McGill University Faculty of Medicine and Royal Victoria Hospital.

Protein, Fluid, and Salt Balance; Thrombosis and Embolism

8:30 a.m., Thursday—Philharmonic Auditorium

ALTON OCHSNER, M.D., F.A.C.S., New Orleans; William Henderson Professor and Director, Department of Surgery, Tulane University of Louisiana School of Medicine, Presiding.

The Magnitude of Base Loss in Fecal Fistulae Combined with Continuous Suction Drainage of the Stomach. EVERETT IDRIS EVANS, M.D., F.A.C.S., and K. KELLER VAN SLYKE, M.D., Richmond, Virginia. Medical College of Virginia.

Abnormal Fluid Distribution in Intractable Postoperative Hypochloremia Further Aggravated by Saline Therapy. RICHARDS P. LYON, M.D., JOSEPH R. STANTON, M.D., F.A.C.S., EDWARD D. FREIS, M.D., and REGINALD H. SMITHWICK, M.D., F.A.C.S., Boston, Massachusetts. Boston University School of Medicine and Massachusetts Memorial Hospitals.

Response to Parenteral Glucose of Normal Kidneys and of Kidneys of Postoperative Patients. DONALD R. COOPER, M.D., and L. VIVIAN IOB, Ph.D., Ann Arbor, Michigan. University of Michigan Medical School.

The Influence of Adrenal Cortical Hormone in Hypochloremic Alkalosis. K. KELLER VAN SLYKE, M.D., and EVERETT IDRIS EVANS, M.D., F.A.C.S., Richmond, Virginia. Medical College of Virginia.

An Experimental Study of Intravenous Alimentation in the Dog. C. MARTIN RHODE, M.D., Philadelphia, Pennsylvania. University of Pennsylvania School of Medicine.

Massive Hepatic Necrosis in the Protein-Depleted, Partially Hepatectomized Rat. R. L. ESTRADA, M.D., Z. A. SIMPSON, M.D., and HARRY M. VARS, Ph.D., Philadelphia, Pennsylvania. University of Pennsylvania School of Medicine.

Human Albumin Nitrogen Balance. DONALD J. FERGUSON, M.D., DAVID STATE, M.D., F.A.C.S., and IVAN D. BARONOFSKY, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

Some Physiologic Effects of Prolonged Administration of Human Albumin. NICHOLAS S. GIMBEL, M.D., CECILIA RIEGEL, M.D., WILLIAM W. GLENN, M.D., JAMES NIXON, M.D., DOUGLAS W. SANDERS, M.D., and MELVIN SOBEL, M.D., Philadelphia, Pennsylvania. University of Pennsylvania School of Medicine and Hospital of the University of Pennsylvania.

The Influence of Fat in the Diet Upon Nitrogen Metabolism and Liver Protein Regeneration. HARRY M. VARS, Ph.D., and CHARLES E. FRIEDGOOD, M.D., Philadelphia, Pennsylvania. University of Pennsylvania School of Medicine.

Measurements of Healing Strength of a Standard Wound in Anemic or Starvation States and After Treatment With Blood Transfusions or Refeeding. YOSHIO SAKO, M.D., ARNOLD KREMEN, M.D., and RICHARD L. VARCO, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

Pulmonary Embolism. RICHARD H. LILLIE, M.D., and ROBERT W. BUXTON, M.D., F.A.C.S., Ann Arbor, Michigan. University of Michigan Medical School.

Experimental Pulmonary Embolism. BYERS W. SHAW, M.D., WILLIAM D. HOLDEN, M.D., F.A.C.S., DONALD B. CAMERON, M.D., PATRICK C. SHEA, JR., M.D., and JOHN H. DAVIS, JR., M.D., Cleveland, Ohio. Western Reserve University School of Medicine and University Hospitals.

The Effect of Moderate Degrees of Dicumarol-Induced Hypoprothrombinemia on Experimental Intravascular Thrombosis. J. FORBES ROGERS, M.D., RAYMOND J. BARRETT, M.D., and CONRAD R. LAM, M.D., F.A.C.S., Detroit, Michigan. Henry Ford Hospital.

Clinical Studies on the Heparin Cofactor. WILLIAM D. HOLDEN, M.D., F.A.C.S., JOHN H. DAVIS, JR., M.D., and JOHN W. COLE, M.D., Cleveland, Ohio. Western Reserve University School of Medicine.

Experimental Venous Thrombosis and Its Prevention by Dicumarol. DONALD B. CAMERON, M.D., WILLIAM D. HOLDEN, M.D., F.A.C.S., BYERS W. SHAW, M.D., and PATRICK C. SHEA, JR., M.D., Cleveland, Ohio. Western Reserve University School of Medicine.

Neurosurgery; Radioactive Substances; Irradiation

8:30 a.m., Thursday—Ballroom, The Biltmore Hotel

CLARENCE E. STAFFORD, M.D., F.A.C.S., Los Angeles; Acting Head, Department of Surgery, College of Medical Evangelists, Presiding.

Anhidrosis as a Measure of Sympathetic Denervation. GRACE M. ROTH, Ph.D., and WINCHELL MCK CRAIG, M.D., F.A.C.S., Rochester, Minnesota. Mayo Foundation.

Continuous Procaine Paravertebral Sympathetic Blocks. J. R. THOMASON, M.D., and WILLIAM H. MORETZ, M.D., Salt Lake City, Utah. University of Utah School of Medicine and Salt Lake General Hospital.

A Study of the Action of Sympathomimetic Drugs in Combination with Intrathecal Anesthetic Agents. JOHN C. HENDERSON, M.D., LOUIS E. SIGLER, M.D., and I. B. TAYLOR, M.D., Detroit, Michigan. Wayne University College of Medicine and City of Detroit Receiving Hospital.

The Effects of Position on the Cerebral Circulation of Man. H. A. SHENKIN, M.D., W. G. SCHEUERMAN, M.D., and E. B. SPITZ, M.D., Philadelphia, Pennsylvania. University of Pennsylvania School of Medicine and Hospital of the University of Pennsylvania.

The Role of Nerve Blocks in Restoring the Balance of Traumatic Cord Bladders. ERNEST BORS, M.D., A. E. COMARR, M.D., and S. H. MOULTON, M.D., Van Nuys, California. Birmingham Veterans Administration Hospital.

Clinical Evaluation of Radiofluorescein as an Aid in the Localization of Brain Tumors. SAMUEL W. HUNTER, M.D., LYLE A. FRENCH, M.D., and GEORGE E. MOORE, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

Distribution of Tracer Doses of Methionine Tagged with Radio Sulfur in Normal and Neoplastic Tissue. ARNOLD J. KREMEN, M.D., SAMUEL W. HUNTER, M.D., GEORGE E. MOORE, M.D., and CLAUDE HITCHCOCK, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

The Use of Radioactive Phosphorus for Diagnostic Study of Lesions of the Breast. HORACE J. MCCORKLE, M.D., F.A.C.S., B. V. A. LOW-BEER, M.D., H. GLENN BELL, M.D., F.A.C.S., and ROBERT STONE, M.D., San Francisco, California. University of California Medical School.

Changes in the Clotting Mechanism Associated with Total Body Exposure to Ionizing Irradiation. J. GARROTT ALLEN, M.D., F.A.C.S., Chicago, Illinois. University of Chicago College of Medicine and Argonne National Laboratory.

A Comparison of Blood Volumes in Surgical Patients as Determined by Radioactive Phosphorus Tagged Red Cells and T-1824 Dye. HERMAN M. NACHMAN, M.D., JOHN W. MOORE, Ph.D., and EVERETT IDRIS EVANS, M.D., F.A.C.S., Richmond, Virginia. Medical College of Virginia.

Radioactive Isotopes as Diagnostic and Prognostic Aids in Peripheral Vascular Disease. MORRIS T. FRIEDELL, M.D., F.A.C.S., FENTON SCHAFFNER, M.D., and WILLIAM J. PICKETT, M.D., F.A.C.S., Chicago, Illinois. Hektoen Institute for Medical Research, Cook County Hospital.

Fluorescein as an Adjunct in the Treatment of Radionecrotic Ulcers. HERMAN RICE, M.D., and BROMLEY S. FREEMAN, M.D., F.A.C.S., Temple, Texas. McCloskey Veterans Administration Hospital.

The Use of Beta Irradiation for Corneal Scarring. WILLIAM H. BOYD, M.D., Los Angeles, California.

Gall Bladder; Pancreas; Intestines; Miscellaneous

8:30 a.m., Friday—Philharmonic Auditorium

WARREN H. COLE, M.D., F.A.C.S., Chicago; Professor of Surgery and Head, Department of Surgery, University of Illinois College of Medicine, Presiding.

The Value of the Secretin Test in Surgery. HENRY DOUBILET, M.D., F.A.C.S., New York, New York. New York University College of Medicine.

Gall Bladder Excretion Studies Following Gastric Resection. IVAN D. BARONOFSKY, M.D., DAVID GAVISER, M.D., and EDWARD A. BOYDEN, M.D., Minneapolis, Minnesota. University of Minnesota Medical School.

An Experimental Method of Repair of Common Duct Strictures. JOHN R. SCHEIBE, M.D., Chicago, Illinois. University of Illinois College of Medicine.

The Role of the Sphincter of Oddi in the Prevention of Cholangitis. CHRISTIN LAZATIN, M.D., WILLIAM T. FITTS, JR., M.D., and DAVID Y. COOPER, M.D., Philadelphia, Pennsylvania. University of Pennsylvania School of Medicine and Hospital of the University of Pennsylvania.

Total Pancreatectomy with a Report of the Postoperative Physiological Studies. JACK GREENFIELD, M.D., and JACK H. SANDERS, M.D., Memphis, Tennessee. Veterans Administration Medical Teaching Group, Kennedy Hospital.

The Cause of Death in Strangulation Obstruction. PAUL NEMIR, JR., M.D., H. R. HAWTHORNE, M.D., F.A.C.S., D. L. DRABKIN, M.D., and ISIDORE COHN, JR., M.D., Philadelphia, Pennsylvania. University of Pennsylvania School of Medicine.

Effects of Streptomycin in Conditions Involving Infections of the Peritoneum. H. A. DAVIS, M.D., F.A.C.S., Los Angeles, California. Department of Surgery and Graduate School of Medicine, College of Medical Evangelists.

Experimental Mesenteric Vascular Occlusion. JOHN W. DERR, M.D., and RUDOLF J. NOER, M.D., F.A.C.S., Detroit, Michigan. Wayne University College of Medicine.

The Use of Peritoneal Grafts to Reinforce Suture Lines Following Anastomosis of the Intestines. SPENCER T. CHESTER, M.D., FREDERICK BINKLEY, M.D., H. GLENN BELL, M.D., F.A.C.S., and HORACE J. MCCORKLE, M.D., F.A.C.S., San Francisco, California. University of California Medical School.

The Surgical Treatment of Heredofamilial Polyposis of the Colon. EARL J. BOEHME, M.D., Los Angeles, California.

Experimental Use of a Skin-Lined Tube in the Greater Omentum. J. R. MCCORRISTON, M.D., and D. W. MACKENZIE, JR., M.D., Montreal, Quebec. McGill University Faculty of Medicine.

Studies on the Mechanism of Vomiting. R. M. WHITROCK, M.D., and HENRY L. TIECHE, M.D., Ann Arbor, Michigan. University of Michigan Medical School.

The Use of Urecholine in Postoperative Distention. CLARENCE E. STAFFORD, M.D., F.A.C.S., ARTHUR I. KUGEL, M.D., and ALEXANDER DEDERER, M.D., Los Angeles, California. College of Medical Evangelists.

The Physiological Effects of Curare: Its Failure to Pass the Placental Membrane or Inhibit Uterine Contractions. PHYLLIS HARROUN, M.D., and CARL W. FISHER, M.D., San Francisco, California. University of California Medical School.

Vascular Surgery; Blood Flow; Urology

8:30 a.m., Friday—Ballroom, The Biltmore Hotel

CLARENCE J. BERNE, M.D., F.A.C.S., Los Angeles; Professor of Surgery, University of Southern California School of Medicine, Presiding.

The Experimental Use of Vein Grafts in Establishing an Anastomosis Between the Portal and Systemic Systems. EDWARD SHARKEY, M.D., Albany, New York. Albany Medical College.

Comparison of Suture Anastomosis, Non-Suture Anastomosis, and Polythene Tubing for Restoration of Circulation in the Critical Extremity. ALLAN D. CALLOW, M.D., and C. STUART WELCH, M.D., F.A.C.S., Boston, Massachusetts. Tufts College Medical School.

Acceleration of the Velocity of Venous Flow in the Deep Veins of the Lower Extremity of Man by Local Compression. JOSEPH R. STANTON, M.D., EDWARD D. FREIS, M.D., and ROBERT W. WILKINS, M.D., Boston, Massachusetts. Boston University School of Medicine.

The Effect of Tetra-Ethyl-Ammonium Chloride on Peripheral Blood Flow. J. ROSS VEAL, M.D., F.A.C.S., JOHN N. SHADID, M.D., and WILLIAM L. JAMISON, M.D., Washington, District of Columbia. Georgetown University School of Medicine.

The Use of Tetra-Ethyl-Ammonium Chloride as a Vasodilator in Peripheral Vascular Disease; Its Effect on Sympathectomized Extremities. JAMES B. FRENCH, M.D., WILLIAM E. ADOLPH, M.D., and THEODORE B. MASSELL, M.D., Los Angeles, California. College of Medical Evangelists and Birmingham Veterans Administration Hospital.

The Rationale of Therapy in Acute Vascular Occlusions Based upon Micrometric Observations. HAROLD LAUFMAN, M.D., F.A.C.S., WAYNE B. MARTIN, M.D., and STANLEY W. TUELL, M.D., Chicago, Illinois. Northwestern University Medical School.

A Method for Recording Arterial Pressure and Pressure Pulse Contours and Changes in the Circulation of Patients Studied by This Method. R. D. DRIPPS, M.D., K. F. EATHER, M.D., and L. H. PETERSON, Ph.D., Philadelphia, Pennsylvania. Hospital of the University of Pennsylvania and University of Pennsylvania School of Medicine.

Local Reaction to Oxidized Cellulose and Gelatin Hemostatic Agents in Experimentally Contaminated Renal Wounds. FRANK HINMAN, JR., M.D., and KENWARD O. BABCOCK, M.D., San Francisco, California. University of California Medical School.

The Effect of Temporary Renal Vascular Occlusion on Renal Function. CORNELIUS W. VERMEULEN, M.D., JOHN R. SCHEIBE, M.D., and ERNEST GIRALDI, M.D., Chicago, Illinois. University of Illinois College of Medicine.

Clinical Experiences with the Artificial Kidney. JOHN T. MACLEAN, M.D., CHARLES B. RIPSTEIN, M.D., NANNIE K. M. DE LEEUW, M.D., and G. GAVIN MILLER, M.D., F.A.C.S., Montreal, Quebec. Royal Victoria Hospital and McGill University Faculty of Medicine.

Urinary Stress Incontinence; Physiologic Restoration of Function of Sphincter Muscles. ARNOLD H. KEGEL, M.D., F.A.C.S., Los Angeles, California.

Uretero Sigmoid Anastomosis. JUSTIN J. CORDONNIER, M.D., St. Louis, Missouri. Washington University School of Medicine.

TWENTY-SEVENTH ANNUAL HOSPITAL STANDARDIZATION CONFERENCE—

BILTMORE HOTEL, LOS ANGELES

OCTOBER 18 TO 22, 1948

Monday, 10:00 a.m.–12:30 p.m.—Ballroom

Opening Session of the Clinical Congress—General Assembly

For program see outline of General Assembly program on a preceding page.

Monday, 2:00–5:00 p.m.—Ballroom

Panel Discussions

Presiding: HORACE TURNER, Spokane; Administrator, Deaconess Hospital; President, Association of Western Hospitals

A Message from the President of the Association of Western Hospitals

HORACE TURNER, Spokane.

2:00–3:30 p.m.

Panel Discussion—Newer Developments in Medical Science and How They Affect Hospital Administrative Practices

Moderator: CHARLES B. PUESTOW, M.D., F.A.C.S., Chicago; Professor of Surgery, and Assistant Dean in Charge of Graduate Education in Surgery, University of Illinois College of Medicine and the Illinois Post-Graduate Medical School; Chief Surgical Consultant, Veterans Administration Hospital, Hines.

Collaborators:

Surgery

JOEL W. BAKER, M.D., F.A.C.S., Seattle; Surgeon-in-Chief, Virginia Mason Hospital

Medicine

BURRELL O. RAULSTON, M.D., Los Angeles; Professor of Medicine and Dean of the University of Southern California School of Medicine.

Pathology

ALVIN G. FOORD, M.D., Pasadena, Associate Professor of Pathology, University of Southern California School of Medicine and Director, Department of Pathology, Collis P. and Howard Huntington Memorial Hospital.

Nursing

SISTER HELEN, R.N., Los Angeles; Director of Nurses, St. Vincent's Hospital.

3:30–3:45 p.m.

Intermission

3:45–5:00 p.m.

Panel Discussion—Trend of Hospitals to Supply Facilities and Services for Members of the Medical Staff

Moderator: RITZ E. HEERMAN, Los Angeles; Superintendent, The California Hospital

Collaborators:

The Purposeful Use of the Staff Office in a General Hospital

JAMES K. STACK, M.D., F.A.C.S., Chicago; Assistant Professor of Bone and Joint Surgery, Northwestern University Medical School; Attending Surgeon, Passavant Memorial Hospital.

Doctors' Professional Building Connected with the Hospital

ROBERT L. SANDERS, M.D., F.A.C.S., Memphis; Associate Professor of Clinical Surgery, University of Tennessee College of Medicine; Senior Consulting Surgeon, John Gaston Hospital.

Use of One Floor of Hospital for Doctors to see Patients

HERMAN SMITH, M.D., Chicago; Hospital Consultant.

PRESIDENTIAL MEETING

Monday, 8:15–10:30 p.m.—Philharmonic Auditorium

Hospital Representatives attending the Twenty-Seventh Annual Hospital Standardization Conference are most cordially invited to the Presidential Meeting and Reception following.

Tuesday, 10:00 a.m.–12:30 p.m.—Music Room

Symposium—Current Medico-Administrative Advances in Hospitals

Presiding: CLARENCE E. REES, M.D., F.A.C.S., San Diego; Surgeon, Mercy and San Diego County General Hospitals and Rees—Stealy Clinic

Opening Remarks—The Purpose of the Session

CLARENCE E. REES, M.D., San Diego.

Integration of the General Practitioner Into the Medical Staff Organization.

CURTIS H. LOHR, M.D., Clayton, Missouri; Superintendent and Medical Director, St. Louis County Hospital

Hospitals and Anesthetists

HENRY K. BEECHER, M.D., Boston; Dorr Professor of Research in Anesthesia, Harvard Medical School; Anesthetist-in-Chief, Department of Surgery, Massachusetts General Hospital

The Organization and Functioning of the Surgical Committee

FREDERICK G. KOLOUCH, M.D., Ph.D., F.A.C.S., Twin Falls, Idaho; Department of Surgery, Twin Falls Clinic.

The Need, Organization and Functioning of an Emergency Department in a General Hospital (illustrated with lantern slides)

ALFRED E. MAFFLY, Berkeley: Administrator and HENRY X. JACKSON, M.H.A., Assistant Administrator, Herrick Memorial Hospital.

Discussion—Questions and Answers.

Conducted by HERMAN SMITH, M.D., F.A.C.H.A., Chicago; Hospital Consultant; Formerly Superintendent, Michael Reese Hospital.

Tuesday, 2:00–5:00 p.m.—Music Room

Presiding: WILLIAM P. BUTLER, San Jose; Manager, San Jose Hospital.

Regional Hospital Planning.

GORDON A. FRIESEN, Kitchener, Ontario; Administrator, Kitchener-Waterloo Hospital

The Evaluation of an Integrated Clinical and Research Program in Cancer in a Large General Hospital.

IAN MACDONALD, M.D., C.M., F.A.C.S., Los Angeles; Assistant Clinical Professor of Surgery, University of Southern California School of Medicine; Attending Surgeon, Tumor Surgery, Los Angeles County Hospital.

Maintaining Standards Notwithstanding Rising Hospital Costs.
CLARENCE E. WONNACOTT, Salt Lake City; Administrator, Dr. W. H. Groves, Latter-Day Saints Hospital.
Developing Leadership Through Good Supervision.
KENNETH WILLIAMSON, Chicago; Assistant Director, American Hospital Association.

Tuesday, 8:00–10:00 p.m.—Music Room

Panel Discussion—Evaluating the Various Departments and Services of the Hospital According to the Plan of the Point Rating System.
Conducted by MALCOLM T. MACEACHERN, M.D., C.M., F.A.C.H.A., Chicago; Associate Director, American College of Surgeons and HENRY G. FARISH, M.D., M.H.A., Southampton, New York; Superintendent, Southampton Hospital
Physical Plant
CORNELIUS GRAY, Los Angeles; Chief Engineer, The California Hospital.
Administration
PAUL C. ELLIOTT, Los Angeles; Executive Secretary and Administrator, Hollywood Presbyterian Hospital-Olmsted Memorial
Medical Staff Organization
E. VINCENT ASKEY, M.D., F.A.C.S., Los Angeles; Instructor in Surgery, University of Southern California School of Medicine; Member, Senior Surgical Staff, St. Vincent's Hospital
Medical Records Department.
NORMA BAUMANN, R.R.L., Indianapolis; President-Elect, American Association of Medical Record Librarians; Medical Record Librarian, Methodist Hospital.
Clinical Laboratory.
GEORGE D. MANER, M.D., Los Angeles; Pathologist, Good Samaritan Hospital; President, California Society of Pathologists.
X-Ray Department.
ROY LAMAR FIELDER, M.D., Los Angeles; Radiologist, Methodist Hospital; President, Radiological Society of the Los Angeles County Medical Association.
Nursing Service.
HELEN MACKRILL, R.N., Los Angeles; Director of Nurses, Hollywood Presbyterian Hospital-Olmsted Memorial.
Dietary Department.
JUANITA KENEFICK, Los Angeles; Dietitian, Children's Hospital.
Surgical Department.
LEWIS A. ALESEN, M.D., F.A.C.S., Los Angeles; Associate Clinical Professor of Surgery, College of Medical Evangelists; Secretary, Los Angeles Surgical Society.
Obstetrical Department.
CARL E. KRUGMEIER, M.D., Los Angeles; President, Obstetrical Section, Los Angeles County Medical Association.
Anesthetic Department.
J. WILLIAM SHUMAN, JR., M.D., Los Angeles; President, Anesthesia Section, Los Angeles County Medical Association.
Physical Therapy Department.
LOUIS P. BIRO, M.D., Los Angeles; Director of Physical Medicine, California and Santa Monica Hospitals.
School of Nursing.
ZELLA NICOLAS, R.N., M.A., Los Angeles; Director of Nurses, The California Hospital; Chairman, Southern California Chapter, California League of Nursing Education.
Outpatient Department.
BEN A. NEWMAN, M.D., Los Angeles; Chairman, Out-Patient Committee, Cedars of Lebanon Hospital.
Pharmacy.
CHARLES HAGAN, Santa Monica; Chief Pharmacist, Santa Monica Hospital; Chairman, Pharmacists Section, Association of Western Hospitals.
Medical Social Service Department.
HELEN E. BOARDMAN, R.S.W., Los Angeles; Director of Social Service, Children's Hospital; Vice-Chairman, Medical Social Workers Section, Association of Western Hospitals.
Occupational Therapy Department.
MARIAN DAVIS, Los Angeles; President, Occupational Therapists Section, Association of Western Hospitals.

Wednesday, 7:45–9:45 a.m.—Conference Room No. 2

Breakfast Conference—Joint Session for Press and Radio Representatives and Hospital Personnel

Wednesday, 10:00 a.m.–12:30 p.m.—Music Room

Panel Discussion—A Survey of Special Problems as Related to Hospital Standardization in Its Approval Program.

Wednesday, 2:00–5:00 p.m.—Music Room

Joint Session with the American Association of Medical Record Librarians.
Conducted by G. OTIS WHITECOTTON, M.D., Oakland; Medical Director, Highland-Alameda County Hospital.
Introduction to Discussion.
SISTER MARY SERVATIA, S.S.M., R.R.L., St. Louis, Missouri; President, American Association of Medical Record Librarians; Medical Record Librarian, St. Mary's Hospital.
Panel Discussion—The Statistical Data Content of Hospital Reports.
Moderator: EDNA K. HUFFMAN, R.R.L., Chicago; Field Representative, American Association of Medical Record Librarians.
Collaborators:
Deaths—
MARGARET TAYLOR, R.R.L., Rochester, New York; Medical Record Librarian, Rochester General Hospital.
Infections—
GERTRUDE GUNN, R.R.L., Indianapolis; In Charge of the Medical Record Department, Indiana University Medical Center.
Autopsies—
VIRGINIA KELLOGG, R.R.L., R.N., Seattle; Director, Medical Records, The King County Hospital.
Consultations—
CLEO B. NELSON, R.R.L., San Francisco; In charge of Record Room, San Francisco Hospital.
The Point Rating System for Hospitals and Its Application.
HENRY G. FARISH, M.D., M.H.A., Southampton, New York; Superintendent, Southampton Hospital.
The Medical Audit.
MALCOLM T. MACEACHERN, M.D., Chicago; Associate Director, American College of Surgeons.
Discussion—Questions and Answers.
Conducted by G. OTIS WHITECOTTON, M.D., Oakland.

Wednesday, 8:00–10:00 p.m.—Music Room

Joint Session for Hospital Trustees, Physicians and Hospital Administrators.
RITZ E. HEERMAN, F.A.C.H.A., Los Angeles; Superintendent, The California Hospital, *Presiding.*
Recent Interpretation by the Attorney General of California with Reference to What Constitutes the Practice of Medicine by Corporations.
HONORABLE JUDGE R. MORGAN GALBRETH, Los Ange-

les; Trustee, Hollywood Presbyterian Hospital—Olmsted Memorial.

The Reaction of Hospital Trustees to the Controversy on the Resolutions of the Los Angeles County Medical Association.

COLLIS P. HOLLIDAY, Pasadena; Trustee, Collis P. and Howard Huntington Memorial Hospital.

Open Forum.

The General Responsibilities of Hospital Trustees.

Moderator: JAMES A. HAMILTON, F.A.C.H.A., Minneapolis; Professor and Director, Course in Hospital Administration, University of Minnesota; Hospital Consultant.

Collaborators: ROLLAND MAXWELL, Los Angeles; President, Board of Directors, Methodist Hospital of Southern California.

HOWARD BURRELL, Los Angeles; Trustee, The California Hospital.

Thursday, 10:00 a.m.–12:30 p.m.—Music Room

Round Table Conference—Common Problems of the Small Hospital in Maintaining Acceptable Standards for the Care of the Sick and Injured.

Conducted by PAUL H. FESLER, Oklahoma City;

The program for this session will embrace a survey and study of pertinent problems as related to the organization, management and services of the small hospital in serving its community through adhering to the standards of the American College of Surgeons.

Thursday, 2:00–5:00 p.m.—Music Room

Forum—Trends in Hospital Administration, New Ideas and Procedures and Special Hospital Problems.

Conducted by FRANK R. BRADLEY, M.D., F.A.C.H.A., St. Louis; Director, Barnes Hospital; Professor of Hospital Administration, Washington University School of Medicine.

Opportunity is being given to the graduates and administrative interns of the various Universities now offering courses in hospital administration to present summary transcripts of new ideas and trends in hospital work, including planning and construction, improved equipment, new procedures and technics, administrative problems, personnel management, public relations and other phases of hospital administration. The names of contributors to this program and subjects of their presentations will appear in a special program issued at the Clinical Congress.

Thursday, 8:00–10:00 p.m.—Music Room

Panel Discussion—Nursing the Patient.

Moderator: JOSEPH R. CLEMMONS, M.D., New York; Medical Director, Roosevelt Hospital.

Collaborators:

The Present Situation in Nurse Recruitment and Nursing Service in Hospitals.

PEARL MCIVER, R.N., Washington; President, American Nurses' Association; Director of Public Nursing, U.S. Public Health Service.

Comments on the Report of the Committee of the American Medical Association on Nursing Problems.

HOWARD C. NAFFZIGER, M.S., M.D., F.A.C.S., San Francisco; Professor of Surgery, University of California Medical School; Surgeon-in-Chief, University of California Hospital.

FRANK R. BRADLEY, M.D., F.A.C.H.A., St. Louis; Director, Barnes Hospital; Professor of Hospital Administration, Washington University School of Medicine.

MARGUERITE L. MACLEAN, R.N., Oakland; Director of Nurses, Highland-Alameda County Hospital.

Auxiliary Workers in the Field of Nursing.

a. The Present Status of the Nurses Aide in the Nursing of the Patient.

GEORGE F. WOLLGAST, M.D., F.A.C.S., Denver; Assistant in Surgery, University of Colorado School of Medicine; Member of Staff, Surgery, St. Luke's and St. Joseph's Hospitals.

b. Volunteer Workers in the Nursing Services—Scope, Availability and Control.

M. LOUISE FLOYD, R.N., Los Angeles; Director, Nursing Service, American Red Cross, Los Angeles Chapter.

My Conception of Efficient Nursing Service in our Hospitals.

ANTHONY J. J. ROURKE, M.D., F.A.C.H.A., San Francisco; Director, Stanford University Hospitals.

Friday, Morning and Afternoon

Visits to hospitals in Los Angeles and vicinity arranged with the Hospital Council of Southern California.

PRELIMINARY CLINICAL PROGRAM

PARTICIPATING HOSPITALS AND HOSPITAL CLINICS COMMITTEE

The California Hospital, Los Angeles—William F. Quinn, M.D.
Cedars of Lebanon Hospital, Los Angeles—Adolph A. Kutzmann, M.D., F.A.C.S.
Children's Hospital, Los Angeles—J. Norton Nichols, M.D., F.A.C.S.
French Hospital, Los Angeles—Pierre Paul Viole, M.D.
Hollywood Presbyterian Hospital-Olmsted Memorial—William H. Snyder, M.D., F.A.C.S.
Hospital of the Good Samaritan, Los Angeles—Francis M. McKeever, M.D.
Collis P. and Howard Huntington Memorial Hospital, Pasadena—Leroy B. Sherry, M.D., F.A.C.S.
Los Angeles County Hospital, Los Angeles—Clarence J. Berne, M.D., F.A.C.S.
Los Angeles Sanitarium—Alfred Goldman, M.D.
Methodist Hospital of Southern California, Los Angeles—Paul A. Quaintance, M.D., F.A.C.S.
Orthopaedic Hospital, Los Angeles—Ward M. Rolland, M.D., F.A.C.S.
Physicians and Surgeons Hospital, Glendale—John R. Paxton, M.D., F.A.C.S.
Queen of Angels Hospital, Los Angeles—Donald E. Ross, M.D., F.A.C.S.
St. John's Hospital, Santa Monica—George Arnold Stevens, M.D., F.A.C.S.
St. Joseph Hospital, Burbank—Ralph H. Walker, M.D., F.A.C.S.
St. Luke Hospital, Pasadena—James M. Marshall, M.D. F.A.C.S.
St. Vincent's Hospital, Los Angeles—William P. Kroger, M.D., F.A.C.S.
Santa Fe Coast Lines Hospital, Los Angeles—Richard J. Flamson, M.D., F.A.C.S.
Santa Monica Hospital, Santa Monica—Leo J. Madsen, M.D., F.A.C.S.
U.S. Army, McCornack General Hospital, Pasadena—Colonel Lawrence C. Ball, M.C., U.S.A.
U.S. Naval Hospital, Long Beach—Captain F. C. Hill, M.D.
U.S. Veterans Administration, Birmingham General Hospital, Van Nuys—Joseph A. Weinberg, M.D., F.A.C.S.
U.S. Veterans Administration Center, Wadsworth General Hospital, Sawtelle—Francis R. X. Byron, M.D., F.A.C.S.
White Memorial Hospital, Los Angeles—Clarence E. Stafford, M.D., F.A.C.S.

CLINICS IN LOS ANGELES AND VICINITY HOSPITALS

THE CALIFORNIA HOSPITAL, LOS ANGELES

Tuesday

8:00–12:00. *General Surgery*. Operative Clinics:
Gastrointestinal Surgery—Vagotomy and Gastroenterostomy. JACK M. FARRIS and ASSOCIATES.
Two Team Abdominal Perineal. MALCOLM R. HILL and ASSOCIATES.
Gastric Resections. WILLIAM F. QUINN, NORMAN L. CARDEY.

Wednesday

8:00–12:00. *General Surgery*. Operative Clinics:
Carcinomas of Face, Neck, and Breast. Los Angeles Tumor Institute Staff.
Carcinoma of the Stomach. LEWIS A. ALESEN.
Thoracic Surgery. Operative Clinic:
Carcinoma of Lung. LYMAN A. BREWER and ASSOCIATES.

Thursday

8:00–12;00. *General Surgery*. Operative Clinics:
Lesions of Thyroid. O. DALE LLOYD.
Cholecystic Disease. WILLIAM HENRY OLDS and ASSOCIATES.
Hernioplasty. FREDERICK W. LEIX and ANTON LAUBERSHEIMER.

Friday

8:00–12:00. *Obstetrics and Gynecology*. Operative Clinics:
Total Hysterectomy. DONALD G. TOLLEFSON and ASSOCIATES.
Vaginal Hysterectomy. PAULA HORN and ASSOCIATES.
Total Hysterectomy. WILLIAM H. BROWNFIELD and ASSOCIATES.
Low Cervical Section and other Gynecological Procedures. RALPH J. THOMPSON, GEORGE W. HEWITT and AARON NEAL WEBB.

CEDARS OF LEBANON HOSPITAL, LOS ANGELES

Tuesday

10:00–12:00. *General Surgery*. Operative Clinic: Thyroidectomy. MAURICE G. KAHN, MAX W. BAY.
10:00–12:00. *Gynecology*. Operative Clinic: Selected cases. EMIL J. KRAHULICK.
10:00–12:00. *Genitourinary Surgery*. Operative Clinic: Selected cases. JAMES STEINBERG.

Wednesday

10:00–12:00. *General Surgery*. Operative Clinic: Smithwick Operation. MARCUS H. RABWIN.
10:00–12:00. *Neurosurgery*. Operative Clinic: Selected cases. TRACY PUTNAM.

Thursday

10:00–12:00. *General Surgery*. Operative Clinic: Abdominal surgery. ISAAC Y. OLCH.
10:00–12:00. *Gynecology*. Operative Clinic: Selected cases. JOSEPH M. HARRIS, LEON KROHN.
10:00–12:00. *Genitourinary Surgery*. Operative Clinic: Selected cases. JAMES STEINBERG.

Friday

10:00–12:00. *General Surgery*. Operative Clinic: Selected cases. SAM S. HERZIKOFF.
10:00–12:00. *Thoracic Surgery*. Operative Clinic: Selected cases. ALFRED GOLDMAN.

Tuesday through Friday

10:00–12:00. *General Surgery.* Nonoperative Clinics: Smithwick Operation; Colectomy; Gall Bladder; Thyroid; Roentgenology; Pathology. MARCUS H. RABWIN, DAVID H. ROSENBLUM, MAX W. BAY, ISAAC Y. OLCH, Members of Thyroid Committee, EUGENE FREEDMAN, N. FRIEDMAN.

CHILDREN'S HOSPITAL, LOS ANGELES

Monday

Thoracic Surgery. Operative Clinics:
Blalock Operation; Bronchoscopies. JOHN C. JONES.
Oral Surgery. Operative Clinics:
Cleft Palates; Cleft Lips. EMIL F. THOLEN.
Orthopedic Surgery. Operative Clinics:
Hip Fusion; Triple Arthrodesis; Biopsy of Knee. JOHN C. WILSON.
11:00–12:00. *Thoracic Surgery.* Nonoperative Clinics:
Patent Ductus Arteriosis; The Blalock Operation.

Tuesday

Otolaryngology. Operative Clinics:
Tonsillectomy and Adenoidectomy; Mastoidectomy. ALDEN MILLER.
Plastic Surgery. Operative Clinics:
Padgett's Grafts; Reconstruction Ears; Excision of Nevus with Graft. WILLIAM S. KISKADDEN.
Ophthalmology. Operative Clinics:
Recession and Resection; Tuck and Recession; O'Connor Cinch; Ptosis, Motais'. A. RAY IRVINE.
11:00–12:00. *Plastic Surgery.* Nonoperative Clinic:
Immediate and Late Results Obtained in the Treatment of Burns.

Wednesday

General Surgery. Operative Clinics:
Herniorrhaphy; Orchiopexy; Appendectomy; Thyroglossal Cyst. LAWRENCE CHAFFIN.
Thoracic Surgery. Operative Clinics:
Coarctation; Patent Ductus. JOHN C. JONES.
11:00–12:00. *General Surgery.* Nonoperative Clinic:
General Pediatric Problems in Childhood.

Thursday

Genitourinary Surgery. Operative Clinics:
Nephrectomy; Bladder Neck Resection; Cystoscopies. O. W. BUTLER.
Orthopedic Surgery. Operative Clinics:
Spinal Fusion; Arthrodesis (Britton type). JOHN C. WILSON.
Proctology. Operative Clinic:
Rectovaginal Fistula. KENNETH E. SMILEY.
Endoscopy. Operative Clinics:
Bronchoscopy; Laryngoscopy. ALDEN MILLER.
Neurosurgery. Operative Clinics:
Cerebellar Exploratory; Choroid Plexectomy; Boneflap. CARL W. RAND.
11:00–12:00. *Orthopedic Surgery.* Nonoperative Clinic:
Clinical Diagnostic Problems.
Neurology. Nonoperative Clinic:
Brain Tumors in Childhood.

Friday

Otolaryngology. Operative Clinic:
Tonsillectomy and Adenoidectomy. ALDEN MILLER.
General Surgery. Operative Clinics:
Pyloroplasty; Herniorrhaphy. WILLIAM J. NORRIS, JAMES NORTON NICHOLS.
Ophthalmology. Operative Clinics:
Recession and Resection; Enucleation; Ptosis. A. RAY IRVINE.
11:00–12:00. *Ophthalmology.* Nonoperative Clinic:
Squint and Muscle Surgery.
Otolaryngology. Nonoperative Clinic:
Acute Obstructive Laryngitis.

FRENCH HOSPITAL, LOS ANGELES

Wednesday

10:30–10:50. *Tumor Surgery.* Nonoperative Clinic: Radical Cancer Surgery of Head and Neck—slides—cases. SAM L. PERZIK.
10:50–11:10. *Tumor Surgery.* Nonoperative Clinic: Combined Attack of Cancer of Head and Neck—slides—cases. CLYDE K. EMERY.
11:10–11:20. *Tumor Surgery.* Nonoperative Clinic: Benign Tumors of Neck—slides. ALOIS POLLAK.
11:20–11:30. *General Surgery.* Nonoperative Clinic: Removal of Thyroglossal Duct Cyst—motion pictures. ELMER J. BALL.

Wednesday Afternoon

Round Table Discussion. ARTHUR J. MENDENHALL, FRED GASPARD, IVO LOPIZICH, VICTOR CEFALU, PIERRE PAUL VIOLE.

HOLLYWOOD PRESBYTERIAN HOSPITAL—OLMSTED MEMORIAL

Tuesday

8:00–12:00. *Tumor Surgery.* Nonoperative Clinic:
Cases Presented with Followup. C. HIRAM WEAVER and STAFF.

Wednesday

8:00–10:00. *Tumor Surgery.* Operative Clinic:
Radical Mastectomy with Cautery. C. HIRAM WEAVER and STAFF.
8:00–12:00. *Genitourinary Surgery.* Operative Clinic:
Urological Surgery. STAFF.
8:00–12:00. *General Surgery.* Operative Clinics:
Thyroidectomy; Gastric Resection; Lobectomy. STAFF.
10:00–11:00. *General Surgery.* Nonoperative Clinic:
Nonsurgical treatment for Genital Relaxation Including Urinary Incontinence, with Exhibit. ARNOLD H. KEGEL.
10:00–12:00. *General Surgery.* Nonoperative Clinic:
Traumatic Injuries to Abdomen. DONALD C. COLLINS.

Thursday

8:00–12:00. *General Surgery.* Operative Clinic:
Selected Cases. STAFF.
9:00–10:00. *Plastic Surgery.* Operative Clinic:
Mastopexy. HERBERT OTTO BAMES.
10:00–12:00. *Plastic Surgery.* Nonoperative Clinic:
Demonstration Plastic Technique. HERBERT OTTO BAMES.

HOSPITAL OF THE GOOD SAMARITAN, LOS ANGELES

Tuesday

8:00–12:00. *General Surgery.* Operative Clinic: Selected Cases. LAWRENCE CHAFFIN, WILLIAM J. NORRIS.
8:00–12:00. *Thoracic Surgery.* Operative Clinic: Selected Cases. JOHN C. JONES.
8:00–12:00. *Neurosurgery.* Operative Clinic: Selected Cases. GEORGE H. PATTERSON.

Wednesday

8:00–12:00. *General Surgery.* Operative Clinic: Selected Cases. PHILIP J. CUNNANE.
8:00–12:00. *Genitourinary Surgery.* Operative Clinic: Selected Cases. KENNETH E. SMILEY.
8:00–12:00. *Neurosurgery.* Operative Clinic: Selected Cases. CARL W. RAND.
9:00–12:00. *Ophthalmology.* Operative Clinic: Selected Cases. GEORGE P. LANDEGGER.

Thursday

8:00–12:00. *General Surgery.* Operative Clinic: Selected Cases. CLARENCE J. BERNE, JAMES NORTON NICHOLS, KENNETH W. BLAKE.
8:00–12:00. *Thoracic Surgery.* Operative Clinic: Selected Cases. FRANK S. DOLLEY.
Otorhinolaryngology. Operative Clinic: Selected Cases. P. SHUMAKER.

Friday

8:00–12:00. *General Surgery.* Operative Clinic: Selected Cases. LAWRENCE CHAFFIN.
8:00–12:00. *Genitourinary Surgery.* Operative Clinic: Selected Cases. WILLIAM H. KIGER.
8:00–12:00. *Gynecology.* Operative Clinic: Selected Cases. HENRY M. SHAW.
8:00–12:00. *Orthopedic Surgery.* Operative Clinic: Selected Cases. JOHN C. WILSON.

COLLIS P. AND HOWARD HUNTINGTON MEMORIAL HOSPITAL, PASADENA

Tumor Surgery. Operative Clinic:
Selected Cases. GEORGE S. SHARP, EUGENE W. DEMAREE.
Plastic Surgery. Operative Clinic:
Correction of Burn Contractures. GEORGE V. WEBSTER.
Gas Therapy. Operative Clinic:
Application of Intermittent Positive Pressure Breathing for Control of Respiratory Depression. JOHN B. DILLON.
Orthopedic Surgery. Operative Clinic:
Early Recognition and Treatment of Congenital Hips. JOSEPH CHARLES RISSER.
General Surgery. Operative Clinic:
Abdominal Surgery in the Aged and Portacaval Anastomoses in Cirrhosis of the Liver. ARTHUR C. PATTISON.
Pathology. Nonoperative Clinic:
Tumors and Cysts of the Ovary—A Pathologic Demonstration. ALVIN G. FOORD.
General Surgery. Nonoperative Clinic:
The Cardiac Risk in Surgery. GEORGE GRIFFITH.
Tumor Surgery. Nonoperative Clinic:
Tumor Clinic Demonstration—Selected Cases to Show the Operation of a Diagnostic Tumor Clinic in a Voluntary Hospital. EDWARD D. KREMERS and STAFF.

LOS ANGELES COUNTY HOSPITAL, LOS ANGELES

Monday

9:00 *General Surgery.* Nonoperative Clinics:
Symposium on Esophageal and Gastric Disease. HAROLD LINCOLN THOMPSON.
Surgery of Carcinoma of the Esophagus. LYMAN A. BREWER.
Hiatus Hernia, Surgical Management. JOSEPH L. ROBINSON.
Vagus Resection in Treatment of Peptic Ulcer. JOSEPH A. WEINBERG.
Surgical Management of Massive Hemorrhage from the Upper Gastrointestinal Tract. E. ERIC LARSON.
The Need of More Radical Surgery in Gastric Carcinoma. HAROLD LINCOLN THOMPSON.

Tuesday

8:00. *Genitourinary Surgery.* Operative Clinics:
Intravesical Retropubic Prostatectomy. TRACY O. POWELL.
Transurethral Prostatic Resection. ROGER W. BARNES.
Thoracic Surgery. Operative Clinic:
Pneumonectomy. FRANK S. DOLLEY, LYMAN A. BREWER.
Thoracic Surgery. Nonoperative Clinic:
Discussion on Problems of Anesthesia in Thoracic Surgery. JOHN B. DILLON.
Tumor Surgery. Operative Clinic:
The Commando Type of Operation for Carcinoma of the Floor of the Mouth. SAMUEL L. PERZIK, LEWIS W. GUISS.
Discussion during surgery of the Problem of Intraoral Cancer. IAN MACDONALD.
General Surgery. Operative Clinics:
Radical Mastectomy. LAWRENCE CHAFFIN.
Discussion during surgery. PHILIP J. CUNNANE.
Thyroidectomy. PHILIP J. CUNNANE.
Discussion during surgery. LAWRENCE CHAFFIN.
Portacaval Shunt. ARTHUR C. PATTISON.
Discussion during surgery. WILLIAM H. SNYDER.
Cholecystectomy. WILLIAM H. SNYDER.
Discussion during surgery. ARTHUR C. PATTISON.
9:30. *General Surgery.* Nonoperative Clinics:
Thyroid Symposium. CONRAD J. BAUMGARTNER, Moderator.
Hazards of Thyroidectomy. LEWIS F. ELLMORE.
Organic Blood Iodine Levels Observed in Diagnosis and Treatment of Thyroid Disease. EUGENE J. JOERGENSON.
The Problem of the "Aberrant Thyroid." CLARENCE J. BERNE.
The Newer Anti-Thyroid Drugs. PAUL STARR.
The Use of Radioactive Iodine in the Treatment of Thyroid Disease. MYRON PRINZMETAL.
Genitourinary Surgery. Nonoperative Clinics:
Discussion of Methods of Prostatectomy. TRACY O. POWELL, Moderator.
Endoscopic Identification of Tissue during Transurethral Prostatic Resection (lantern slide demonstration). ROGER W. BARNES, Moderator.
10:00. *Genitourinary Surgery.* Operative Clinics:
Nephrolithotomy. ADOLPH A. KUTZMANN.
Transurethral Resection of Bladder Tumor. R. THEODORE BERGMAN.
11:30. *Genitourinary Surgery.* Nonoperative Clinics:
Discussion of Renal Surgery for Stone. ADOLPH A. KUTZMANN.
Discussion of Endoscopic Treatment of Bladder Tumor. R. THEODORE BERGMAN.

Wednesday

8:00–12:00. *General Surgery.* Operative Clinic:
Gastric Resection. E. ERIC LARSON.
Discussion during surgery. CLARENCE J. BERNE.
General Surgery. Nonoperative Clinic:
Problem of Gastric Surgery in a Private Hospital; Types of Resection; Operative Morbidity and Mortality; Results.
General Surgery. Operative Clinics:
Common Duct Stone. CLARENCE J. BERNE.
Discussion during surgery. JOHN R. PAXTON.
Vagotomy and Gastroenterostomy. EUGENE J. JOERGENSON.

Results of Vagotomy at Los Angeles County General Hospital. HARRY C. PROUT.

General Surgery. Nonoperative Clinic:
Causes of Upper Gastro-intestinal Bleeding (illustrated). HAROLD LINCOLN THOMPSON.

General Surgery. Operative Clinic:
Resection of Lesion of Cardiac End of Stomach. HAROLD LINCOLN THOMPSON.
Discussion during surgery. EUGENE J. JOERGENSON.

General Surgery. Nonoperative Clinic:
Problems of Anesthesia in Thoracicoabdominal Approach to Cardiac End of Stomach. JOHN B. DILLON.

Proctology. Operative Clinics:
Repair of the Incontinent Anal Sphincter. PAUL C. BLAISDELL.
Anal Fissure. PAUL C. BLAISDELL.
Abdominoperineal Resection—Two-team. MALCOLM R. HILL and ASSOCIATES.

Obstetrics and Gynecology. Operative Clinics:
Vaginal Hysterectomy. CARL E. KRUGMEIER.
Discussion during surgery. WILLIAM C. BRADBURY.
Total Hysterectomy. WILLIAM C. BRADBURY.
Discussion during surgery. CARL E. KRUGMEIER.

Orthopedic Surgery. Operative Clinics:
Spinal Fusion. JOSEPH CHARLES RISSER.
Discussion during surgery. G. MOSSER TAYLOR.
Intratrochanteric Fracture, The Neufeld Nail. G. MOSSER TAYLOR.
Discussion during surgery. ALONZO J. NEUFELD.

Orthopedic Surgery. Nonoperative Clinics:
Discussion between cases—Anatomical Considerations of the Region of the Hip. CHRISTOPHER MASON, Moderator.
Problems of Anesthesia. JOHN B. DILLON.

9:30. *Tumor Surgery*. Nonoperative Clinics:
Malignancy Symposium. IAN MACDONALD, Moderator.
Combined Procedures for Intraoral Cancer with Cervical Metastases. LEWIS W. GUISS, SAMUEL L. PERZIK.
Detection and Management of Biologically Inoperable Mammary Carcinoma. LEO M. LEVI.
Diagnosis and Treatment of Uterine Carcinoma (Cervix, Corpus). JUSTIN J. STEIN.

Thursday

8:00–12:00. *Obstetrics and Gynecology*. Operative Clinics:
Suspension of Vaginal Vault from Abdominal Route. HENRY N. SHAW.
Manchester Operation. HAROLD K. MARSHALL.
Presacral Neurectomy. ERLE HENRIKSEN.

Genitourinary Surgery. Operative Clinics:
Nephrectomy (with discussion). JAY J. CRANE.
Retropubic Prostatectomy. SAMUEL K. BACON, FREDERICK A. BENNETTS.
Perineal Prostatectomy. CARL F. RUSCHE, DONALD A. CHARNOCK.

Thoracic Surgery. Operative Clinic:
Lobectomy. JOSEPH L. ROBINSON.
Discussion during surgery. JOHN C. JONES.

Neurosurgery. Operative Clinics:
Thoracolumbar Sympathectomy. RUPERT B. RANEY, GEORGE H. PATTERSON.
Cervical Disc. AIDAN A. RANEY, HERBERT G. CROCKETT.
Brain Tumor. PHILIP J. VOGEL, FRANK M. ANDERSON.
Supradiaphragmatic Sympathectomy (Peet Operation). EMIL SELETZ, HENRY MICHAEL CUNEO.

General Surgery. Operative Clinic:
Thyroidectomy. CLARENCE E. STAFFORD.
Discussion of Thyroid Problems. CONRAD J. BAUMGARTNER.

General Surgery. Nonoperative Clinic:
Discussion—Differential Diagnosis of Tumor of the Neck (Illustrated with charts and models).

General Surgery. Operative Clinic:
Branchial Fistulectomy. CONRAD J. BAUMGARTNER.
Discussion of Congenital Lesions of the Neck. CLARENCE E. STAFFORD.

9:30. *Orthopedic Surgery*. Nonoperative Clinic:
Fractures. VERNON P. THOMPSON, Moderator.
Fractures and Dislocations of the Hip; Fracture of the Femur; Fracture of the Tibia. SAMUEL S. MATTHEWS, PAUL E. MCMASTER, G. MOSSER TAYLOR, ALONZO J. NEUFELD.

Friday

8:00–12:00. *Proctology*. Operative Clinics:
Abdominoperineal Resection. ROBERT L. BELT, WILLIAM H. DANIEL.
Fistulectomy.
Hemorrhoidectomy.
Anal Ulcer Excision.

Orthopedic Surgery. Operative Clinics:
Amputation. FRANCIS M. MCKEEVER.
Open Reduction Fractured Tibia. PAUL E. MCMASTER.
Osteotomy of Hip. VERNON P. THOMPSON.
Discussion between cases.

Tumor Surgery. Operative Clinic:
Radical Mastectomy. EUGENE J. JOERGENSON.
Discussion of Cancer of Breast. JUSTIN J. STEIN.

Tumor Surgery. Nonoperative Clinic:
Biopsy Techniques—Discussion between cases. CLARENCE E. NELSON.

Tumor Surgery. Operative Clinic:
Radical Neck Dissection. JUSTIN J. STEIN.
Discussion during surgery. CLARENCE E. NELSON, EUGENE J. JOERGENSON.

General Surgery. Nonoperative Clinic:
Anatomy of Inguinal and Femoral Regions (Demonstration with charts). COL. LAWRENCE BALL, GORDON K. SMITH.

General Surgery. Operative Clinic:
Surgical Repair of Indirect Inguinal Hernia. COL. LAWRENCE BALL, GORDON K. SMITH.

General Surgery. Nonoperative Clinic:
Survey of Hernia Repair, McCornack General Hospital and Los Angeles County General Hospital from June, 1946 to June, 1948 (charts and discussion). COL. LAWRENCE BALL, GORDON K. SMITH.

General Surgery. Operative Clinic:
Surgical Repair of Direct Inguinal Hernia. COL. LAWRENCE BALL, GORDON K. SMITH.

General Surgery. Nonoperative Clinic:
General Discussion of Anesthesia in Elective and Emergency Surgical Procedures for Repair of Hernia. JOHN B. DILLON.

General Surgery. Operative Clinic:
Surgical Repair of Femoral Hernia. COL. LAWRENCE BALL, GORDON K. SMITH.
General Discussion.

General Surgery. Operat ve Clinic:
Obstructive Jaundice (Stone Common Duct). JAMES NORTON NICHOLS.
General Discussion. LEWIS A. ALESEN.

General Surgery. Nonoperative Clinic:
Discussion between cases—The Diagnosis of the Acute Abdomen in Children. JAMES NORTON NICHOLS.

General Surgery. Operative Clinic:
Subtotal Gastrectomy Illustrating Use of Alesen Tube. LEWIS A. ALESEN.
Discussion during surgery. JAMES NORTON NICHOLS.

General Surgery. Nonoperative Clinic:
Symposium on Fluid, Nitrogen, and Electrolyte Balance. CLARENCE J. BERNE, Moderator.
General Review of Current Concepts. J. M. FARRIS.
Discussion of Nitrogen Balance. HARRY A. DAVIS
Discussion of Acid-Base Balance. RALPH E. HOMANN.
Presentation of Illustrative Cases. HELEN E. MARTIN.

LOS ANGELES SANITARIUM, DUARTE

Tuesday

8:00–12:00. *Thoracic Surgery.* Operative Clinic:
Total Pleurectomy and Pneumonectomy for Pulmonary Tuberculosis. ALFRED GOLDMAN.

1:30–3:30. *Thoracic Surgery.* Nonoperative Clinic:
Case Presentations Demonstrating Indications for Surgical Management of Pulmonary Tuberculosis with Special Emphasis on Indications for Surgical Resection of the Lung. ALFRED GOLDMAN, JACOB SEGAL.

METHODIST HOSPITAL OF SOUTHERN CALIFORNIA, LOS ANGELES

Monday

8:00–12:00. *Thoracic Surgery.* Operative Clinic:
Selected Cases. LYMAN A. BREWER, FRANK S. DOLLEY.

8:00–12:00. *Tumor Surgery.* Operative Clinic: Selected Cases. CLYDE EMERY TUMOR GROUP, SAMUEL L. PERZIK.

8:00–12:00. *Orthopedic Surgery.* Operative Clinic: Selected Cases. HAROLD E. CROWE, KENNETH TOWNSEND.

8:00–12:00. *Ophthalmology and Otolaryngology.* Operative Clinic: Selected Cases. WALTER R. CRANE.

Friday

8:00–12:00. *Genitourinary Surgery.* Operative Clinic:
Selected Cases. FREDERICK A. BENNETTS, CARL L. MULFINGER.

8:00–12:00. *Obstetrics and Gynecology.* Operative Clinic:
Selected Cases. ALEX A. BLATHERWICK, CARL E. KRUGMEIER, ELDON W. TICE.

8:00–12:00. *General Surgery.* Operative Clinic: Selected Cases. CLIFFORD O. BISHOP, GEORGE R. DUNLEVY, LEWIS F. ELLMORE, ADOLPH M. HANSEN, ELMER A. NELSON, ROY E. SHIPLEY, JOSEPH A. PARKER, HAROLD P. TOTTEN.

8:00–12:00. *Hand Surgery.* Operative Clinic:
Selected Cases. JOSEPH H. BOYES.

ORTHOPAEDIC HOSPITAL, LOS ANGELES

Monday

8:00–11:00. *Orthopedic Surgery.* Operative Clinic: Spinal Fusion for Scoliosis. JOSEPH CHARLES RISSER.

Wednesday

8:00–10:00. *Orthopedic Surgery.* Operative Clinic: Fascial Transplants. CHARLES LOWMAN.

Thursday Morning

10:00–12:00. *Orthopedic Surgery.* Nonoperative Clinic:
Surgical Conference. HAROLD E. CROWE.

Every Afternoon

Orthopedic Surgery. Nonoperative Clinic.

PHYSICIANS AND SURGEONS HOSPITAL, GLENDALE

Days not yet decided

8:30–12:00. *Gynecology.* Operative Clinic: Vaginal Plastic Procedures. HAROLD K. MARSHALL.

8:30–12:00. *General Surgery.* Operative Clinic: Two-Team Abdominoperineal Resection of Rectum. A. ELMER BELT.

8:30–12:00. *General Surgery.* Operative Clinic: Resection Carcinoma of Esophagus or Transthoracic Vagotomy. HAROLD LINCOLN THOMPSON.

Orthopedic Surgery. Nonoperative Clinic:
Knee Surgery. HUGH T. JONES.

Orthopedic Surgery. Nonoperative Clinic:
Surgical Treatment of Fractures—motion pictures. CHARLES W. GILFILLAN.

Orthopedic Surgery. Nonoperative Clinic:
Internal Fixation of Fractures. JOSEPH WOLF.

Orthopedic Surgery. Nonoperative Clinic:
Backache. JOHN R. BLACK.

Gynecology. Nonoperative Clinic:
General Vaginal Prolapse. HAROLD K. MARSHALL, DANSON TARR, MATT STURDEVANT.

QUEEN OF ANGELS HOSPITAL, LOS ANGELES

Tuesday

1:30–3:30. *Otorhinolaryngology.* Operative Clinics:
Fenestration Operation. HOWARD P. HOUSE.
Laryngectomy. ALDEN MILLER.
Nasoplastic Operation. JOSEPH GAYNOR.

3:30–5:30. Otorhinolaryngology. Nonoperative Clinics:
Illustrated Lecture on Acute Obstructive Laryngitis. ALDEN MILLER.
Deafness in Children Treated by Radiation. LAWRENCE K. GUNDRUM.
Sclerotic Mastoid and its Roentgen Interpretation. GILBERT R. OWEN.

Wednesday

8:00–11:00. *Obstetrics and Gynecology.* Operative Clinics:
Total Hysterectomy. FRANK F. SCHADE.
Vaginal Hysterectomy. SAMUEL MARTINS.
Vaginal Plastic Operation for Correction Cystocele, Rectocele and Laceration of Pelvic Floor. H. NIEBERGALL.
Vaginal Plastic Operation for Correction of Stress Incontinence of Urine (Kennedy Procedure). DANIEL R. MISHELL.

8:00–11:00. *General Surgery.* Operative Clinics:
Diaphragmatic Hernia, Thoracic Approach. J. Norman O'NEILL.
Gall Bladder. ROBERT B. STEWART.

8:00–11:00. *Orthopedic Surgery.* Operative Clinics:
Herniated Disc. CHRISTOPHER MASON.
Pinning of Fracture of Neck of Femur. FRED ILFELD.
Arthrotomy for Benign Tumor. JOSEPH PELUSO.

11:30–1:00. *Obstetrics and Gynecology.* Nonoperative Clinics:
Pregnancy Following Conservative Treatment for Pelvic Endometriosis. DANIEL R. MISHELL and UMBERT E. ANZ.
Early Rupture of the Uterus Before the Onset of Labor. A.M. McCARTHY and C. V. VON DER AHE.
Low Spinal Anesthesia in Obstetrics. A Report of 2,000 cases. FRANK F. SCHADE and WILLIAM CALDWELL.

1:30–3:30. *Otorhinolaryngology.* Nonoperative Clinic:
Discussion Frontal Sinus Operation. J. McKENZIE BROWN.
Lesion of the Floor of Mouth and Neck. COLBY HALL.
Surgical Repair of Injuries of the 7th Nerve. PIERRE VIOLE.
Correction of Septal Deformities. VICTOR GOODHILL.
Foreign Bodies in the Esophagus and Respiratory Tract. SIMON JESBERG.
Malignancies of the Mastoid. HAROLD BOYD.

Posthesis of the Middle Ear. MAX POHLMAN.
1:30–3:30. *Ophthalmology*. Operative Clinics:
Strabismus: Demonstration of the O'Connor Cinch Operation and Recession of the Inferior Oblique Muscle. ALFRED ROBBINS.
Cataract: Extraction by the Castroviejo Suction Tech-Technique. MAURICE NUGENT.
Combined Extraction. STEPHEN POPOVICH.
Glaucoma: Decompression Operation. IRVING SCHUMAN.
3:30–5:30. Ophthalmology. Nonoperative Clinics:
The Treatment of Corneal Scars by Beta Irradiation. WILLIAM H. BOYD.
The Tuohy Corneal Lens. MAURICE NUGENT.
Complication Following Cataract Extractions. IRVING SCHUMAN.
The Scleral Shortening Operation for Detachment of the Retina. (Motion pidture in color). W. E. BORLEY.
Essential Hypertension and its Ophthalmoscopic Interpretations. STEPHEN POPOVICH.

Thursday

8:00–11:00. *General Surgery*. Operative Clinics:
Thyroidectomy. WALTER U. SULLIVAN and TENERO D. CARUSO.
Radical Mastectomy. DONALD E. ROSS.
Abdominal Perineal Resection of Rectum. WILLIAM H. DANIEL.
Colon Surgery. JAMES L. NELLER and D. A. GAZZANIGA.
8:00–11:00. *Orthopedic Surgery*. Operative Clinics:
Intermedullary Pinning of Fracture. Anterior Approach to Elbow Joint. HOMER C. PHEASANT.
Osteotomy and Fixation of Non-Union of Neck of Femur by a New Reverse Nail. GALE HUNT.
Subcutaneous Faciotomy for Dupuytren's Traction. J. VERNON LUCK.
11:30–1:00. *Orthopedic Surgery*. Nonoperative Clinics:
End Results of Intermedullary Pinning of Fracture. ALFRED E. GALLANT.
Slipped Upper Femural Epiphysis. GALE HUNT.
Subcutaneous Faciotomy (Motion picture). J. VERNON LUCK.
Reconstruction of Elbow Injuries. HOMER C. PHEASANT.

Friday

8:00–11:00. *General Surgery*. Operative Clinics:
Tractotomy for Tic Douloureux. RUPERT B. RANEY.
Gall Bladder Surgery. WALTER M. HOLLERAN.
Carcinoma of Bladder. FREDERICK A. BENNETTS.
Partial Gastrectomy. JAMES F. REGAN.
Resection Carcinoma of Esophagus. FRANK S. DOLLEY and LYMAN A. BREWER.
Retropubic Prostatectomy. MORTON M. MAYERS.
Thyroidectomy. DANIEL FORTMANN.
11:30–1:00. *General Surgery*. Nonoperative Clinics:
Radical Mastectomy (Motion picture in sound and color). DONALD E. ROSS.
Mastopexy (Motion picture in color). JOSEPH GAYNOR.
Sympathectomy (Motion picture). RUPERT B. RANEY.
Diabetes Mellitus Complicating Surgery. KENDRICK SMITH.

ST. JOHN'S HOSPITAL, SANTA MONICA

Monday

8:00–10:00. *General Surgery*. Operative Clinic: Surgery of the Gallbladder. RODERICK M. NEALE.
8:00–10:00. *Obstetrics and Gynecology*. Operative Clinic: Cesarean Section (Bi-cornuate Uterus). B. H. WATSON.
10:00–12:00. *General Surgery*. Operative Clinic: Surgery of the Colon. G. ARNOLD STEVENS.
10:00–12:00. *Orthopedic Surgery*. Operative Clinic: Laminectomy with Spinal Fusion. DANIEL H. LEVINTHAL.

Tuesday

8:00–10:00. *General Surgery*. Operative Clinic: Thyroidectomy. G. ARNOLD STEVENS.
8:00–10:00. *Obstetrics and Gynecology*. Operative Clinic: Anterior and Posterior Colpoperineoplasty and Kelly Stitch. JAMES C. DOYLE and ALOYSIUS C. MIETUS.
10:00–12:00. *General Surgery*. Operative Clinic: Gastric Resection. MARCUS H. RABWIN and DAVID H. ROSENBLUM.
10:00–12:00. *Orthopedic Surgery*. Operative Clinic: Arthrotomy of the Knee. DANIEL H. LEVINTHAL.

Wednesday

8:00–10:00. *General Surgery*. Operative Clinic: Radical Mastectomy. JOHN F. ROBERTS.
8:00–10:00. *Genitourinary Surgery*. Operative Clinic: Retro-pubic Prostatectomy. GILBERT J. THOMAS and FRED C. SCHLUMBERGER.
10:00–12:00. *General Surgery*. Operative Clinic: Vagotomy and Posterior Gastroenterostomy. FRANCES E. BROWNE and HENRY J. LANGE
10:00–12:00. *Plastic Surgery*. Operative Clinic: Rhinoplasty. J. J. PRESSMAN.

Thursday

8:00–10:00. *General Surgery*. Operative Clinic: Herniorrhaphy (Tantalum Gauze and Tantalum Wire). MARCUS H. RABWIN and DAVID H. ROSENBLUM.
8:00–10:00. *Obstetrics and Gynecology*. Operative Clinic: Total Hysterectomy. B. H. WATSON.
10:00–12:00. *General Surgery*. Operative Clinic: McVay Herniorrhaphy. FRANCIS E. BROWN and HENRY J. LANGE.
10:00–12:00. *General Surgery*. Operative Clinic: Exploration of Common Duct. G. ARNOLD STEVENS.
Daily: Pathological, nonoperative clinic, Rapid Method of Surgical Tissue Diagnosis. G. H. HUMMER.
Daily: Micro. Laboratory, nonoperative clinic, Photographic Aids. G. H. HUMMER.

ST. JOSEPH HOSPITAL, BURBANK

Days not yet decided

General Surgery. Operative Clinic: Selected cases.

ST. LUKE HOSPITAL, PASADENA

Day not yet decided

Orthopedic Surgery. Nonoperative Clinic.
Genitourinary Surgery. Nonoperative Clinic.

ST. VINCENT'S HOSPITAL, LOS ANGELES

Tuesday

9:00–10:00. *Otolaryngology*. Operative Clinic: Selected cases. J. MACKENZIE BROWN.
9:00–10:00. *Ophthalmology*. Operative Clinic: Selected cases. A. RAY IRVINE.
9:00–11:00. *General Surgery*. Operative Clinic: Thyroidectomy. WILLIAM P. KROGER.
9:00–11:00. *General Surgery*. Operative Clinic: Selected cases. FRANK J. BRESLIN.
9:00–12:00. *General Surgery*. Operative Clinic: Selected cases. FRANCIS E. BROWNE, HENRY J. LANGE.
9:00–12:00. *Tumor Surgery*. Operative Clinic: Selected cases. IAN MACDONALD, LEWIS W. GUISS.
10:00–..... *Tumor Surgery*. Nonoperative Clinic: Malignant Lesions of Colon. KENNETH S. DAVIS.
10:30–..... *General Surgery*. Nonoperative Clinic: Surgery of Colon—motion pictures. WILLIAM H. DANIEL.

11:00–..... *General Surgery.* Nonoperative Clinic: Surgery of Esophagus—motion picture. HAROLD LINCOLN THOMPSON.
11:00–1:00. *General Surgery.* Operative Clinic: Selected cases. CONRAD J. BAUMGARTNER.
11:00–1:00. *General Surgery.* Operative Clinic: Colon Surgery. RALPH V. BYRNE.

Wednesday

9:00–12:00. *Orthopedic Surgery.* Operative Clinic: Selected cases. HUGH T. JONES, JOHN R. BLACK.
9:00–12:00. *Orthopedic Surgery.* Operative Clinic: Selected cases. FRANCIS M. MCKEEVER.
9:00–12:00. *Neurosurgery.* Operative Clinic: Selected cases. RUPERT B. RANEY.
9:00–12:00. *Neurosurgery.* Operative Clinic: Selected cases. C. HUNTER SHELDEN.
9:00–12:00. *Otolaryngology.* Operative Clinic: Fenestration. HOWARD P. HOUSE.
9:00–12:00. *Ophthalmology.* Operative Clinic: Selected cases. JOHN P. LORDAN.
9:00–12:00. *Plastic Surgery.* Operative Clinic: Selected cases. ARTHUR E. SMITH.
10:00–..... *Tumor Surgery.* Nonoperative Clinic: Thyroid Malignancy. HENRY J. LANGE.
10:30–..... *Tumor Surgery.* Nonoperative Clinic: Struma Lymphomatosa and Fibrosis. ROBERT C. SURRIDGE.
11:00–..... *General Surgery.* Nonoperative Clinic: Obstructive Corrosive Gastritis. LOUIS C. BENNETT.

Thursday

9:00–11:00. *General Surgery.* Operative Clinic: Selected cases. E. VINCENT ASKEY.
9:00–..... *Otolaryngology.* Operative Clinic: Selected cases. JOSEPH B. STEVENS.
9:00–12:00. *Gynecology.* Operative Clinic: Selected cases. BERNARD J. HANLEY, JOHN C. MCDERMOTT.
9:00–12:00. *Proctology.* Operative Clinic: Surgery of Colon. WILLIAM H. DANIEL.
9:00–12:00. *General Surgery.* Operative Clinic: Vagus Neurectomy. EDWARD C. PALLETTE.
9:00–12:00. *Ophthalmology.* Operative Clinic: Selected cases. CLARENCE H. ALBAUGH.
10:00–..... *Orthopedic Surgery.* Nonoperative Clinic: Surgery of Hand. FRANK J. BRESLIN.
10:30–..... *Orthopedic Surgery.* Nonoperative Clinic: Surgery of Knee Joint. H. T. JONES, J. R. BLACK.
11:00–..... *Neurosurgery.* Nonoperative Clinic: Surgical Management of Intracranial Aneurysms—motion picture and lantern slide illustrations.
11:00–1:00. *General Surgery.* Operative Clinic: Selected cases. E. ERIC LARSON.

Friday

9:00–11:00. *General Surgery.* Operative Clinic: Selected cases. LOUIS C. BENNETT.
9:00–11:00. *Plastic Surgery.* Operative Clinic: Selected cases. ARTHUR E. SMITH.
9:00–12:00. *General Surgery.* Operative Clinic: Selected cases. FRANCIS E. BROWNE, HENRY J. LANGE.
9:00–12:00. *General Surgery.* Operative Clinic: Selected cases. WILLIAM P. KROGER, ROBERT C. SURRIDGE.
9:00–12:00. *Genitourinary Surgery.* Operative Clinic: Selected cases. ALBERT J. SCHOLL, EDMUND CROWLEY.
10:00–..... *General Surgery.* Nonoperative Clinic: Transthoracic Vagus Neurectomy. E. C. PALLETTE.
10:30–..... *General Surgery.* Nonoperative Clinic: Surgery of Spleen. RALPH V. BYRNE.
11:00–..... *General Surgery.* Nonoperative Clinic: Carcinoma of Tongue, or Primary Mandibular Tumors. IAN MACDONALD, LEWIS W. GUISS.
11:00–1:00. *General Surgery.* Operative Clinic: Selected Cases. DAVID A. SCHMIDT.

SANTA FE COAST LINES HOSPITAL, LOS ANGELES

Monday

9:00–11:00. *Genitourinary Surgery.* Operative Clinic: Retropubic Prostatectomy. V. J. GALLAGHER.
9:00–10:00. *Neurosurgery.* Nonoperative Clinic: The Herniated Intervertebral Disc; Discussion of Multiple Herniations. HENRY M. CUNEO.
9:00–10:00. *Otorhinolaryngology.* Nonoperative Clinic: Allergy of the Nose and Paranasal Sinuses. GORDON J. MCCURDY.

THE SANTA MONICA HOSPITAL

Thursday

9:00–11:00. *General Surgery.* Nonoperative Clinics: Traumatic Surgery. CHARLES A. LINDQUIST.
A New Method for the Movement of Fluids in the Extremities. J. P. SAMPSON and FREDERICK G. KIRBY.
Orthopedic Surgery. Operative Clinic:
Reconstructive Orthoplasty of Congenitally Dislocated Hip. WILLIAM H. WRIGHT.
Demonstration: Pre-ambulatory Diagram of Dislocated Hips. JOSEPH C. RISSER.
Contrast Orthrogram of Dislocated Hips. RALPH MILLER.

U. S. ARMY, McCORNACK GENERAL HOSPITAL, PASADENA

Friday

9:00–9:30. *Genitourinary Surgery.* Nonoperative Clinic: Amicrobic Urinary Infections. LYMAN STEWART.
9:30–10:00. *General Surgery.* Nonoperative Clinic: The Treatment of Regional Ileitis. GORDON K. SMITH.
10:00–10:30. *Plastic Surgery.* Nonoperative Clinic: Treatment of Facial Injuries. MONROE K. RUCH.
10:30–11:00. *Orthopedic Surgery.* Nonoperative Clinic: Treatment of Fracture of Forearm. VERNON J. LUCK.
11:00–11:30. *General Surgery.* Nonoperative Clinic: Hernia Repair Using Cooper's Ligament. LAWRENCE C. BALL.

U. S. NAVAL HOSPITAL, LONG BEACH

Day not yet decided

9:00–12:00. *General Surgery.* Operative Clinics: Gastrectomy. E. ERIC LARSON. Cholecystectomy. L. L. BEAN.
9:00–12:00. *Genitourinary Surgery.* Operative Clinics: Retro Pubic Prostatectomy. CARL F. RUSCHE.
Varicocelectomy. MILO ELLIK and L. A. NEWTON.
9:00–12:00. *Orthopedic Surgery.* Operative Clinic: Operation for Recurrent Dislocation of the Shoulder. R. R. MYERS and JOHN M. ROWE.
9:00–12:00. *Otorhinolaryngology.* Operative Clinic: Rhinoplasty Using Cancellous Bone. E. KING, ROBERT C. BOYDEN, F. L. ASHLEY.
9:00–12:00. *Neurosurgery.* Nonoperative Clinic: Cerebral Aneurysm. ROBERT H. PUDENZ, CHAS. H. SHELDON, ARTHUR L. SCHULTZ.
9:00–12:00. *Thoracic Surgery.* Nonoperative Clinic: Carcinoma of the Lung. BERT H. COTTON and V. C. STRATTON.
1:00–4:00. *General Surgery.* Nonoperative Clinics: Ward Rounds, Follow-up on Vagus Resection and Gastric Resection. E. ERIC LARSON, RALPH V. BYRNE, WILLIAM E. DELPHY, CALVIN A. LAUER, L. L. BEAN.

1:00–4:00. *Genitourinary Surgery.* Nonoperative Clinic:
Post-operative Results from High Varicocelectomy. CARL F. RUSCHE, MILO ELLIK, and L. A. NEWTON.
1:00–4:00. *Otorhinolaryngology.* Nonoperative Clinic: Motion Pictures: Nasal Bone Graft and Post-operative Results. E. KING, ROBERT C. BOYDEN, KENNETH C. BRANDENBERG.
1:00–4:00. *Neurosurgery.* Operative Clinic:
Trans-frontal Craniotomy or Cervical Disc. C. HUNTER SHELDON, ROBERT H. PUDENZ, ARTHUR L. SCHULTZ.
1:00–4:00. *Thoracic Surgery.* Operative Clinic:
Pneumonectomy. BERT H. COTTON and V. C. STRATTON.
1:00–4:00. *Orthopedic Surgery.* Nonoperative Clinic:
Ward Rounds, Post Operative Care of the Orthopedic Patient. JOHN M. ROWE and R. R. MYERS, J. G. MANNING.

U. S. VETERANS ADMINISTRATION, BIRMINGHAM GENERAL HOSPITAL, VAN NUYS

Wednesday

9:00–12:00. *Genitourinary Surgery.* Nonoperative Clinics:
Results of Uretero-intestinal Implantation and Cystectomy for Carcinoma of Bladder. DONALD C. MALCOLM.
Thoracic Surgery. Operative Clinic:
Pulmonary Decoration. JOSEPH A. WEINBERG
General Surgery. Operative Clinics:
Surgical Problems of the Paraplegic. ERNEST BORS.
Trans-Abdominal Vagotomy and Gastrojejunostomy. FRANKLIN B. WILKINS.
Thoracolumbar Sympathectomy by Intercostal Approach. THEODORE B. MASSELL.
Neurosurgery. Operative Clinic: Cervical Laminectomy for Discogenic Disease. JOHN D. FRENCH.
Otorhinolaryngology. Operative Clinics: Reconstructive Rhinoplasty for Nasal Obstruction. SAMUEL KAPLAN.
Endaural Radical Mastoidectomy. SAMUEL KAPLAN.
10:00–12:00. *Orthopedic Surgery.* Nonoperative Clinics:
Care of Traumatic Injuries to the Hand. JOHN H. ALDES and JOSEPH H. BOYES.
Treatment of Bone and Joint T.B. with Streptomycin. JOHN H. ALDES.

U. S. VETERANS ADMINISTRATION CENTER, WADSWORTH GENERAL HOSPITAL, SAWTELLE

9:00–12:00. *General Surgery.* Nonoperative Clinics:
Symposia. Tetra-ethyl-ammonium in Evaluation of Peripheral Vascular Disease. C. H. MCINTYRE.
Results of Histidine and Ascorbic Acid Treatment of Peripheral Vascular Disease. RUDOLPH WIDMANN and MILTON REYNOLDS.
A New Method for the Movement of Fluids in the Extremities. F. G. KIRBY and J. P. SAMPSON (Santa Monica Hospital).
Orthopedic Surgery. Nonoperative Clinic:
Symposium: Amputations in Peripheral Vascular Disease. ROBERT MAZET.
General Surgery. Operative Clinic:
Lumbar Sympathectomy. CHARLES S. KIPEN.
Anesthesia. Operative Clinic: Pain Clinic. CHARLES F. MCCUSKEY, ERNEST WARNOCK, and NEVIN H. RUPP.
Ophthalmology and Otorhinolaryngology. Nonoperative:
9:00–9:30. Fundus Lesions with Pathological Sections and Microphotographic Slides. A. RAY IRVINE and CLAUDE S. MUMMA.
9:30–10:00. Malignancies of Ear, Nose and Throat with Case Presentations. CLAUDE S. MUMMA and STAFF.
10:00–10:30. Fenestration Operation for Otosclerosis with Case Presentations. CLAUDE S. MUMMA and STAFF.

WHITE MEMORIAL HOSPITAL, LOS ANGELES

Tuesday

9:00–12:00. *Genitourinary Surgery.* Operative Clinic:
Vesical Diverticulectomy and Urethroplasty for Urinary Incontinence. ROGER W. BARNES, R. THEODORE BERGMAN.
9:00–12:00. *Orthopedic Surgery.* Operative Clinic:
Surgical Treatment of Corns, Metatarsal Calluses, Hammer Toe, and Bunions. ALONZO J. NEUFELD and ASSOCIATES.
10:00–11:00. *Genitourinary Surgery.* Operative Clinic:
Transurethral Prostatic Resections. ROGER W. BARNES, R. THEODORE BERGMAN.
11:00–12:00. *Genitourinary Surgery.* Nonoperative Clinic:
Motion Picture Film—Transurethral Prostatic Resection. Lantern Slide Demonstration. Round table discussion. ROGER W. BARNES, Moderator.

Wednesday

9:00–12:00. *General Surgery.* Operative Clinic:
Total Excision of Parotid Gland with Preservation of Facial Nerve. CLARENCE E. NELSON and STAFF.
Obstetrics and Gynecology. Operative Clinics:
Vaginal Hysterectomy; Low Cervical Cesarean Section, RALPH J. THOMPSON and STAFF.

Thursday

9:00–12:00. *Proctology.* Operative Clinics:
Two-team Abdominal Perineal Resection for Carcinoma of the Rectum; Ano-rectal Surgery (Selected Cases). MALCOLM R. HILL and ASSOCIATES.
Otolaryngology. Operative Clinics:
Fenestration; Rhinoplasty; Endoscopic Clinic. BENTON N. COLVER and ASSOCIATES.